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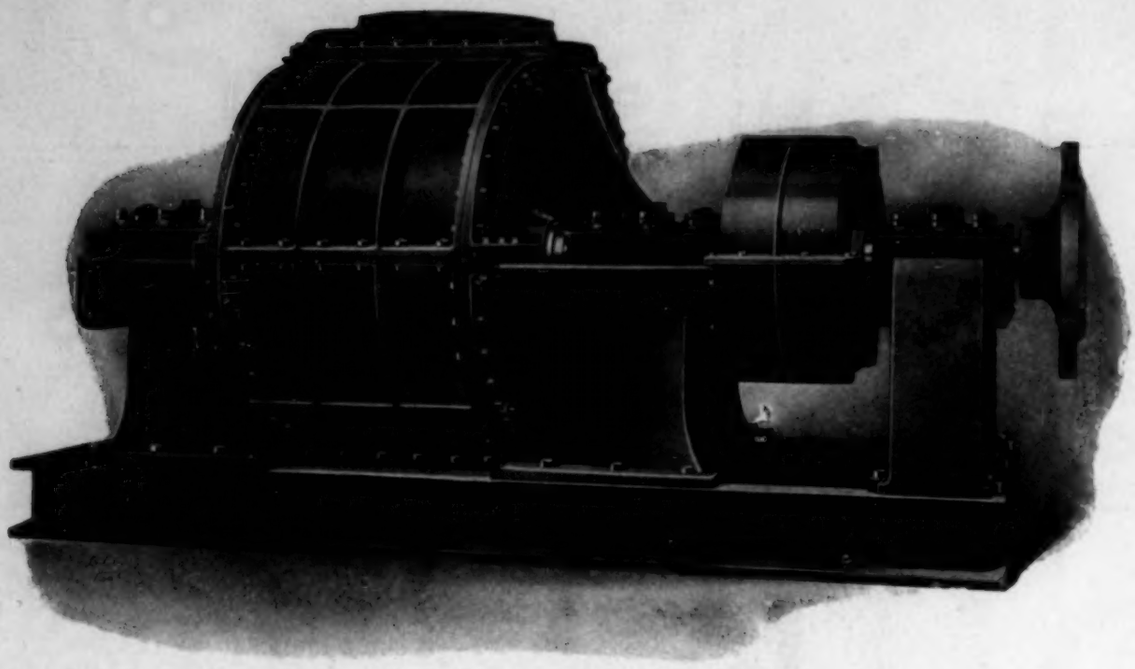

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THE IRON TRADE REVIEW

Vol. LIX Cleveland, December 14, 1916 No. 24

Peace Proposal Excites Interest

But Little Effect is Expected at Early Date—Heavy Inquiry from Foreign Countries Continues—Market Trend Still Upward

THE NEWS of the peace proposal of Germany and her allies naturally was received with keenest interest by iron and steel manufacturers, but they do not believe that the immediate effect on their business will be important and see no prospect of foreign buying being curtailed unless the entente allies consent to begin negotiations and later developments give definite promise of peace. If the immediate effect of the peace talk is to cause some decrease in foreign and domestic demand for leading products, it will not be deplorable and may have good influence ultimately on the general situation.

Railroad Embargoes

Railroad embargoes are having very serious results, especially in curtailing shipments of iron and steel products to the east for export. In order to relieve the present situation, many blast furnaces may be banked throughout the holidays and finishing mills closed. Some foundries in Cleveland may resort to the use of trucks to haul pig iron from furnaces to their plants.

Shell Steel

The possibility of peace negotiations being inaugurated has not stopped consideration of another immense tonnage of shell steel by domestic munition makers aggregating from 400,000 to 500,000 tons, following closely on the placing by French and British governments several weeks ago of fully 1,500,000 tons. Foreign demand for steel rails, especially from Russia, is also very strong and it is understood that American capitalists are being urged to build more plants to meet the demand for rails for export.

Plates

Inquiries for ship steel are coming to this country from foreign buyers in immense volume, but very little of the business offered has been accepted by the mills on account of the filled-up condition of their order books. Owing to the extremely high prices under Lloyds specifications, some foreign buyers are willing to accept very large tonnages of ordinary tank steel for use in ship construction at 5 cents per pound. A Norwegian company, which endeavored to buy from eastern makers 10,000 tons annually for five years failed to interest them. New inquiries include 10,000 tons for Italy. One eastern mill declined to sell 6,000 tons of ship plates for third quarter of next year on account of the uncertainty as to costs of material so far in advance.

Scrap

Great activity in scrap, particularly heavy melting steel, has been a feature of the market during the past week. In Cleveland in one day, sales of heavy melting steel at $27 to $27.50 amounted to $1,000,000, and later sales of this grade were made at nearly $30. In the Philadelphia district, the Pennsylvania railroad obtained the highest prices in its history for its steel scrap, being paid from $25 to $30 per ton. In Pittsburgh, 10,000 tons of heavy melting steel were sold at $27, and some dealers are asking $30.

Pig Iron

The pig iron market continues strong, but is not so excited as during previous weeks. The transactions for export include 50,000 tons of bessemer, which, it is understood, were sold at $37, seaboard. The Cromwell Steel Co., which is building a steel plant at Lorain, O., has sent out an inquiry for 37,500 tons of basic for delivery throughout next year. The pig iron market in the Birmingham district has advanced to $23 to $24 for any delivery. At Buffalo, a flat price of $35 per ton is made for any kind of iron available.

Price Advances

Cast iron pipe has been advanced $2 at New York, Chicago and Birmingham. Higher prices are expected at an early date on bolts, nuts and rivets, and it is probable that wire products will be marked up $3 a ton. Chain has advanced $5. Spikes, which have been very much out of line with other products, have been advanced $13 per ton. Warehouse prices of sheets have been marked up from $5 to $10 per ton.

THE OPEN HEARTH

Proposed Vetoing of Riders

EXTREME interest will be manifested in the outcome of the question that the chamber of commerce of the United States has announced will be voted upon soon by its members to get an expression from the business interests of the country as to whether the President should have the power to veto riders in appropriation legislation. The chamber is to be congratulated for taking this step and the merchants' association of New York deserves the thanks of the country for having presented the question for the consideration of the chamber. The voting will be completed the third week in January.

The Iron Trade Review has heretofore strongly urged that the President be given the power suggested. Incidentally it has proposed that the question be taken up with the chamber for submission to a referendum. Occasion was taken to make that suggestion several month ago in connection with an article *The Iron Trade Review* published regarding a bill introduced at the first session of the present congress by Representative W. Frank James, of Michigan. The James measure would give to the President the power the merchants' association is contending he should have. Arguments in favor of such a bill have been set forth in these columns at length, and need not be repeated. Arguments against the veto proposal carry but little weight, and they, too, having been met and overcome, need not be dwelt upon.

Business men should give careful consideration to the matter and then go on record for or against the proposal. By voting, they will create a sentiment that is wholly desirable. Much of the bad legislation that is enacted can be traced back directly to the lack of well directed activity of business interests in legislation, both national and state. Advantage is taken of this situation by those legislators who are constantly on the alert for "pork". Until business men do become more active along wise lines in legislative affairs, the nation may prepare itself to see a continued surfeit of rider legislation, a shining example of which is the Tavenner anti-efficiency atrocity. The chamber has already stimulated the interest of business men concerning legislation and accomplished much good as a result, but this interest should be greatly heightened and made continuous.

Anyone who is at all acquainted with the *modus operandi* of rider legislation can well appreciate the fact that it will require tremendous pressure to have the constitution so amended as to permit the President to approve or disapprove separate items in an appropriation bill. Many members of congress will have to be prodded sharply before they will vote to send the question to the states for their ratification because it would threaten the life of "pork" legislation. Indeed, it is probable that the first effort exerted in this direction upon congress will not be successful.

The task should be taken up with firm determination again and again, if necessary, because the object is a most worthy one and ought to and surely will prevail if it is pressed vigorously. Moreover, the fact that the business people have increased their interest in legislative matters will in itself carry a compensatory feature that is most gratifying.

A Decisive Victory

THE announcement that the strike of machinists at Dayton, O., has ended with a victory for the employers illustrates what can be done even in these times of scarcity of labor by taking a courageous stand and adhering to it. Naturally many people are inquiring how the strike was won and the reply of Secretary Marshall, of the Dayton Employers' Association, is that the failure of the strike was a logical result of the observance of the motto of the association, "Do right; then, if necessary, fight to a finish."

The Dayton employers were wise in the beginning of the strike in publishing a plain and emphatic statement as to their intentions. They stated without equivocation that they would not comply with any of the demands of the machinists' union. Another important step was the issuing of a notice to employes concerning their rights. This statement, which is one of the best we have ever seen of its kind, was as follows:

To Our Employes:

This company, through its attorney, **will protect you against unlawful acts of pickets.**

It is your right to work for this company upon any terms mutually agreed upon, without any person's permission; to come and go as you please, and not to be molested by any person.

Any **violence, force, threat, insult or abuse** inflicted or threatened against you **by pickets,** strikers or any other person **is unlawful.**

Intimidation or coercion, actual or threatened, whether by words, manner or force of numbers, **is unlawful.**

It is your right to refuse to discuss or argue with strikers or others the subject or the **merits of the strike.** It is unlawful on their part to persist in so doing, or to attempt to compel you to listen to them,

THE OPEN HEARTH

if you so refuse. **The pickets or strikers have the right, in an orderly and peaceable manner** to approach you and **try to persuade you** to their way of thinking, **provided you are willing; OTHERWISE NOT.** It is unlawful for them by any means to persuade you to break any contract with the company.

In case any of your rights are interfered with, report same to the company's office at once, giving names of offenders and witnesses. Law and order will be maintained.

Following these announcements, employers stood by their principles without equivocation, evasion, or hesitation. With war orders estimated at $55,000,000 on hand, the city might be considered an easy prey for labor agitators, but as Mr. Marshall has well expressed it, the city has "kept the faith and re-established her industrial peace on an enduring basis—a guarantee of continued prosperity in which all classes, especially wage earners, will share." Dayton has indeed furnished an object lesson for manufacturing cities of the country.

The Price of Bessemer Iron

SELDOM, if ever, in the history of the iron trade have prices of pig iron moved upward as rapidly as during the past few weeks. It has been very difficult for anyone to say what has been the prevailing price on any grade of pig iron from day to day and only by keeping constantly in touch with as many buyers and sellers as possible could one feel reasonably certain concerning quotations. A controversy has arisen as to the prevailing price on bessemer pig iron at Pittsburgh on Wednesday, Dec. 6, for which date the price published by *The Iron Trade Review* in its table of Prices Present and Past, page 1130 in the issue of Dec. 7, was $35.95, Pittsburgh. A company that is a party to a very important contract which is materially affected by quotations in *The Iron Trade Review* has challenged the correctness of the quotation and stated that it purchased 10,000 tons of standard bessemer pig iron on Tuesday, Dec. 5, at $32.95, Pittsburgh. Investigation has shown that this statement is correct, but it also has shown that a number of sales of standard bessemer were made at $35.95, Pittsburgh. It was confidently asserted at Pittsburgh at that time that $35.95 could not be shaded, and we have evidence of the selling of at least 1,500 tons at the higher price, and also of an offer of an additional lot of 1,500 tons at $35.95 being declined. As the evidence shows, however, that the tonnage sold the first three days of last week at $32.95 was larger than that sold at $35.95, the lower quotation should have been published as the one prevailing at the time stated. In the table Prices Present and Past, the prices are those ruling in the largest percentage of sales at the dates mentioned. We believe this is the only correct basis for such quotations, and when we are convinced that an error has been made, we are perfectly willing to say so.

In this connection we wish to say that we do not believe it is wise to make contracts based on the quotation of pig iron or any other product ruling on any particular day. Unusual conditions may affect the market for a day or a week, and when the contract price of some product is to be determined by the price of pig iron, it would be fairer to both buyer and seller to take as the basis an average of prices prevailing throughout the month. We also wish to add that pig iron prices published in *The Iron Trade Review* are *not asking prices, or what anyone thinks is the prevailing price,* but the price as determined by *actual transactions.* In other words, sales, not opinions, count.

Baker's Plea for Efficiency

SECRETARY of War Newton D. Baker has again made an earnest plea for efficiency in public work. In his annual report to congress, he urges that an efficiency system be established in the place of the one which was eliminated from government plants by act of congress. He expresses the opinion that an efficiency system properly constructed and justly applied is fairer alike to the government and to the employe than any haphazard method. "We are unhappily prevented by existing legislation from any experiments," says the secretary. "Were it otherwise, I would be much interested to discover, if possible, a plan by which the government and its employes might cooperate in the devising and application of methods fair to both for the determination of relative skill and zeal among operatives, which would at the same time protect the interests of the government as employer, and while conserving the strength and energy of the employes distribute justly among them the rewards of faithful service."

The attitude of organized labor has been so steadfastly opposed to efficiency methods that we are afraid the secretary will have trouble in getting any kind of reasonable cooperation from union labor leaders. The overwhelming evidence of people like Miss Tarbell, who have made impartial investigations, is that rational efficiency methods like those of the Taylor system are not only not cruel speeding-up systems, but are systems of eliminating useless motion, so that a given amount of work can be more easily accomplished than under the old methods.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products December 13, average for November, 1916, average for September, 1916, and average for December, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Dec. 13, 1916.	Aver. for Nov., 1916.	Average for Sept., 1916.	Aver. for Dec., 1915.
Bessemer pig iron, Pittsburgh	$35.95	$30.35	$22.20	$19.85
Basic pig iron, Pittsburgh	30.95	25.95	19.075	18.55
No. 2 Fdy. pig iron, Pittsburgh	30.95	26.76	19.50	18.85
Northern No. 2, Fdy., Chgo.	30.00	25.00	18.65	18.00
Lake Superior Charcoal, Chgo.	31.75	23.00	19.75	19.15
Malleable, Chgo.	30.00	25.00	19.15	18.10
Southern No. 2, Birmingham	23.50	19.60	14.38	14.13
Southern Ohio No. 2, Ironton	30.00	23.60	18.35	17.00
Basic, eastern Pa.	30.50	25.00	20.00	18.00
No. 2X Virginia furnace	26.50	23.00	17.50	17.00
No. 2X foundry, Philadelphia	29.50	25.00	19.75	19.25
Ferro mang., Balti.	160.00	160.00	164.00	100.00
Bessemer billets, Pbgh.	60.00	52.00	45.00	29.60
Bess. sheet bars, Pbgh.	60.00	52.00	45.00	30.80
Op.-h'th sh. bars, Pbgh.	60.00	52.00	45.00	30.80
Open-hearth billets, Pbgh.	60.00	52.00	45.00	30.20
Steel bars, Pittsburgh contract.	2.90	2.78	2.60	1.74
Steel bars, Chgo.	3.09	2.89	2.79	1.97
Iron bars, Philadelphia	3.159	2.659	2.659	1.959
Iron bars, Cleveland, local del'y	3.00	2.70	2.40	1.75
Iron bars, Chgo. mill	$2.75	$2.52	$2.35	$1.70
Beams, Chgo. contr.	3.19	3.03	2.79	1.97
Beams, Pittsburgh, contr.	3.00	2.88	2.60	1.74
Beams, Philadelphia	3.409	3.059	2.759	1.959
Tank plates, Pbgh., contract	3.50	3.35	2.95	1.74
Tank plates, Chicago contr.	3.69	3.46	3.19	1.97
Tank plates, Philadelphia	4.159	3.909	3.909	1.959
Sheets, blk., No. 28, Pbgh.	5.00	3.67	2.887	2.54
Sheets, blue an., No. 10, Pbgh.	4.50	3.30	2.925	2.23
Sheets, galv., No. 28, Pbgh.	7.00	5.07	4.22	4.75
Wire nails, Pittsburgh	3.00	2.85	2.60	2.02
Connellsville fur. coke, contr.	4.00	3.75	2.48	2.35
Connellsville fdy. coke, contr.	6.00	5.50	3.17	3.00
Heavy melting steel, Pbgh.	27.00	20.55	16.125	17.40
Heavy melting steel, eastern Pa.	24.00	20.00	15.00	16.00
Heavy melting steel, Chgo.	23.50	19.35	15.50	18.40
No. 1 wrought eastern Pa.	28.00	23.50	21.00	20.00
No. 1 wrought, Chgo.	26.50	21.25	16.62	15.15
Rerolling rails, Chgo.	31.50	24.90	16.90	16.70
Car wheels, Chgo.	22.00	15.95	12.00	14.75

(For Additional Prices See Page 1232.)

Active Buying of Pig for Export

Orders for Large Tonnages Placed and Many Inquiries Pending— New Steel Company at Lorain, O., is Sounding the Basic Market

Pittsburgh, Dec. 12.—The J. P. Morgan interests are reported to have just closed for 50,000 tons of bessemer iron for export at $37, seaboard. So far as can be ascertained, none of the iron will be furnished by valley stacks; it is not unlikely that blast furnaces in Southern Ohio will fill part of the order. Bessemer iron is being held firmly at $35, valley, with some dealers asking as high as $37. The Mesta Machine Co. has opened negotiations for its bessemer iron requirements in 1917; the company will take from 5,000 to 15,000 tons. A local foundry interest is negotiating for 3,000 tons of bessemer iron for delivery the first half of next year. The Follansbee Bros. Co. is understood to have closed for 12,000 tons of basic iron, but price details are not known. This grade is being held at $30, valley, and above. Foundry and malleable irons have commanded as high as $33, valley. The William Tod Co., Youngstown, has taken 500 tons of Virginia foundry iron for shipment the first half of next year and a Canton foundry interest has closed for from 700 to 1,000 tons of foundry iron, which will be furnished by a Cleveland furnace. Lake Superior charcoal iron is selling in this district at $33 to $34, delivered. Demand for charcoal iron is described as fairly heavy.

Officials of several railroads have suggested that blast furnaces and steel works in the central west shut down from Dec. 23 to Jan. 2 to relieve congested traffic conditions. It has been suggested that as many cars as possible be unloaded during that period. Several blast furnace managers appear to be in favor of banking furnaces during the holidays.

Active Foreign Inquiry

New York, Dec. 12.—Trading in pig iron has become less spectacular either as to the size of sales or as to the rapidity of price advances. The upward movement persists, however, as the supply of iron appearing for sale is not heavy. The trade has heard with mixed sentiments and opinions the offering of definite peace proposals by Germany, but is suspending judgment until fuller information is obtainable and the attitude of the allies is made clear. There has been no excitement, however. Some large buyers still have been in the market. A leading Elizabethport consumer bought 10,000 to 15,000 tons of foundry for next year. A soil pipe maker has inquired for 8,000 tons for Newark and Baltimore for last half, but at last reports probably will not buy. Two other melters at Elizabeth and vicinity closed for 1,000 to 1,500 tons each. A Newark steelmaker bought an additional lot of 2,000 tons of eastern Pennsylvania basic for last half at $30, furnace. A Jersey City foundry wants 1,000 tons of foundry iron. Eastern Pennsylvania No. 2X has been sold at $31, tidewater, or $30.25, furnace. Buffalo makers with any iron actually to sell are asking $35, furnace, and have closed some business on this basis.

If the domestic inquiry is lighter, this does not apply to export matters which are as vigorous as ever. Upward of 50,000 tons are actively in the market, much of which have come out this week. Sweden bought 7,000 tons of Alabama foundry, paying more than $26, Birmingham. Another sale of 5,000 tons of Virginia iron was made at a reported price of $28, furnace. There is a foreign inquiry for 3,000 tons of bessemer monthly for as far ahead as the furnaces will supply. Italy wants 10,000 tons of bessemer for first half and Holland two lots of 2,000 tons each of low phosphorus. It remains difficult to find iron to export.

Flat Price

Buffalo, Dec. 12.—Makers and sellers of pig iron in the Buffalo district

(*For complete prices see page* 1232.)

have wiped out schedules for the time being and regardless of grade differentials, iron where obtainable is being sold at $35 per ton. The demand of regular customers coming into the market is augmented by the inquiries of users that had contracted previously for their needs, but now find that furnace interests, in a number of cases, are unable to make deliveries owing to the prevailing shortage of coke, of labor and of cars.

Sales in the past week have been limited because of the small amount of iron that producers seem to have available to meet the delivery requirements of the melters now in the market. Where consumers are able to find tonnages and deliveries that fit in with their needs, they are asked the flat price of $35 regardless of grade. One of the leading producing interests of the district is entirely out of the market and a second furnace interest has absolutely nothing to sell for spot delivery or over the first half of 1917.

It is too early to estimate what effect the so-called peace talk in Europe may have on the market, but in the face of the unusual flat price of $35 for any grade or any deliveries, there are indications that the flat price basis may undergo additional advances.

High Prices on Low Phos.

Philadelphia, Dec. 11.—Numerous buyers still show anxiety to place orders for pig iron and while the volume is not so large as in November, it is sufficient to keep prices moving upward, as producers are disinclined to accept much additional tonnage at present. The market remains buoyant in a pronounced fashion, but is less excitable. In such a specialty as low phosphorus, remarkable prices are shown. A round lot of standard metal, well over 1,000 tons, was sold for late delivery next year to a foreign buyer by an eastern Pennsylvania maker at $55 furnace. The freight to tidewater was inconsequential. Another producer sold at $52 delivered eastern Pennsylvania. On Lebanon low phosphorus, $62.50, furnace, and even more, have been quoted to discourage orders, though the real market is probably around $50, furnace. Sales of special phosphorus bessemer of from 1,500 to 2,000 tons were made at $36 and $38, eastern Pennsylvania furnace. Valley bessemer was quoted in this territory this week at $35, furnace. Recent orders for bessemer placed by an eastern Pennsylvania maker of ingot molds total 2,300 to 3,000 tons. A Washington buyer recently closed for 1,000 tons.

Early malleable warrants from the west were sold at about $32, delivered this territory. A Philadelphia consumer who wanted 1,000 tons of malleable has closed. Eastern basic continues to command $30, furnace. A sale of 2,000 tons to a tidewater consumer was made at this price, or $30.74, delivered. Another lot of 500 tons was put through.

Some of the leading eastern Pennsylvania makers of foundry iron now quote $30, furnace, for No. 2X and have sold this grade at that figure and No. 2 plain at $30.50. Some quotations of $29, furnace, still are outstanding, however. A central Pennsylvania maker sold 3 to 4 per cent silicon at $33, furnace, and later at $36, and now asks $35, furnace, for No. 2X. Virginia furnace iron still is quoted from $26 to $28 for No. 2X, with sales of high silicon at the top figures and quotations at $29. Virginia warrants were sold this week, however, at $24. Iron mills in eastern Pennsylvania have been buyers of 8,000 to 10,000 tons of standard forge for various deliveries next year. The last sales were at $28, eastern Pennsylvania furnace, or from $28.50 to $29, delivered. Delaware river pipemakers have bought miscellaneous lots of foundry and forge iron for mixtures at from $28 to $30, delivered.

Heavy Basic Inquiry

Cleveland, Dec. 12.—A very large volume of inquiry for pig iron, especially basic and foundry grades, is pending in the Cleveland district. The Cromwell Steel Co., which is building a steel plant at Lorain, has sent out an inquiry for 37,500 tons of basic for delivery throughout next year and the Central Steel Co., Massillon, is in the market for 20,000 tons. The unsold tonnage of basic for delivery next year is small and sellers are not showing much interest in pending inquiries. A small tonnage of bessemer has been sold at $35, valley. The railroad situation is causing a great deal of trouble to foundries, many of which are operating on very short supplies and some are considering the advisability of using trucks to haul pig iron from furnaces to their plants.

Chicago Market Strong

Chicago, Dec. 12.—Strength continues to assert itself in the Chicago pig iron market with malleable, foundry and basic quoted at $30, furnace. Inquiry is good, mostly for second half of 1917, but not in sufficient volume to constitute a decided buying movement. Many requests are being received for anticipation of contracts, melters desiring iron scheduled for next month to be shipped them at once. This indicates an increased melt and forecasts an increased demand for iron during next year. The only way these requests can be met is by shipments from stock or from warrant iron and this action tends to reduce the supply on the yards, which already is decidedly small. Another limiting factor is difficulty in obtaining sufficient cars, as railroads are unable to give much more service than is required for the daily output.

Some owners of northern iron held on warrants are not inclined to sell at present, and believe they will be able to realize $35 or more for their holdings. Standard bessemer is quoted at $40, furnace, but practically none of this grade is being moved. Low phosphorus iron is said to be held at $50, furnace, with small business.

Southern iron can be obtained in small tonnages at $23, Birmingham, for prompt delivery, while for last half, when it is possible to place a contract at any figure, the quotation is $24 to $25, Birmingham. Southern furnaces appear to be sold up practically for their first half output and some have disposed of all they can produce before the end of 1917. It is becoming increasingly difficult to place contracts for southern iron for any delivery during next year. Lake Superior charcoal iron remains firm at $30, furnace, but it is difficult to persuade furnace men to accept further tonnage.

Jackson County silveries have advanced somewhat, and 8 per cent is now held by one maker at $39, furnace. Other furnaces which have been quoting lower seem to be out of the market at present, and the above figure apparently is the present minimum.

Quiet at Cincinnati

Cincinnati, Dec. 12.—Prices on pig iron from the south and southern Ohio are unchanged from last week. The market is quiet and not much activity is expected until after the first of the year. Sales are principally in small and scattered lots. The situation has lost none of its strength, because of the feeling that prices for the first half of next year will be much higher. It is known that several large producers in the south are well sold up on both basic and foundry iron for practically the whole of 1917, which is the first time that such a condition has existed in the pig iron market here.

The price of southern No. 2 foundry for last half shipment is from $23 to $24, Birmingham basis. A premium of $1 is asked for the first half. Southern Ohio No. 2 foundry

(*For complete prices see page* 1232.)

is unchanged at $30, Ironton basis, for the last half of 1917, with none available for the first half. Silvery iron is $36, furnace, for 8 per cent silicon, for the last half. Furnaces are sold up for the first half.

Prices Strong

St. Louis, Dec. 11.—The pig iron business in this market practically is at a standstill, but prices are strong on both northern and southern grades. One foundry is asking for quotations on a car of ferro-manganese, 80 per cent, and several inquiries are out for car lots of southern iron. Sales last week included 700 tons of bessemer ferro-silicon iron for delivery over next year, and 300 tons of southern iron.

Southern iron is quoted at $25 a ton, Birmingham, while northern iron is held at $30, Chicago, and $29 to $30, Ironton.

Southern Iron Higher

Birmingham, Dec. 13. (By wire.)—The pig iron market in this district has advanced to $23 to $24 for any delivery.

Not So Feverish

Birmingham, Ala., Dec. 11.—The pig iron market the last week lacked that feverishness which has characterized it for some time. In fact, practically all the producers are out of the market. One or two claim to have reserved 20 per cent to 25 per cent of their expected 1917 make for higher levels. It is, however, safe to say that for the rest of this year and through the entire year of 1917 the Birmingham market will play a small part in sales unless there should be provisions made for the blowing in of several of the old long idle plants; and it is very doubtful whether more than two or three of them could be blown in on account of shortage of raw materials. The producing capacity of the district has practically been reached under present supplies and equipment. There is no spot iron offering except small tonnages, for which producers have been obtaining $23 to $24 per ton at the furnace. Several of the large producers when asked as to their opinion of last half prices, replied that they had nothing to offer, hence were not in position to say. Some sales have been made at $22 to $22.50 per ton at the furnace for last half delivery, but the tonnage has been comparatively small. Buyers do not seem as anxious to buy at this time as they did a week or so ago.

Ferro is Quiet

And Prices on Domestic are Showing More Steadiness

New York, Dec. 12.—Prices in ferro-manganese have displayed more steadiness during the past week and the wide range on the domestic product which recently has characterized the market, especially in the west, has been less conspicuous. Some of the producers who were accepting lower prices recently now are understood to be sold up for an extended period and are talking higher prices. Eastern makers have continued to show firmness in naming prices and $165, delivered, is their quotation either directly to the consumer or to middlemen. In instances, higher has been named. The position of English makers is unchanged and the latter continue to quote $164, seaboard, but are taking practically no business.

The market is less active. Small inquiries for spot are more numerous and these, apparently, are coming from consumers who have not received shipments from abroad as expected. A Milwaukee steelmaker was a recent buyer of 1,000 tons. The Sault Ste. Marie consumer has been inquiring for 1,000 tons. Italy is in the market for 500 tons.

One of the Tonawanda furnaces at Buffalo recently acquired by the Donner Steel Co., shortly will be turned on ferro-manganese and ore for that purpose has been purchased. One of the Dunbar furnaces, which has been making ferro-manganese and spiegeleisen, will be changed to bessemer around Jan. 1.

Export inquiries for spiegeleisen have been more numerous and on some of this business $55, furnace, has been obtainable. One sale of 500 tons was made to Italy, which remains in the market for 1,000 tons. The Algoma Steel Co. has inquired for 1,000 tons. Domestic buying is light. Prices are at $50 to $55, furnace, for 20 per cent.

Consumers of 50 per cent ferro-silicon at present find it practically impossible to buy this metal and some of them virtually have been begging for material without result. The two domestic producers are declining to make any quotations at present owing to their heavy obligations and because it is not certain whether one of these makers will be able to produce as much as estimated by reason of doubt over power supplies. A buyer in the Wheeling district has been inquiring for 1,000 tons and there is an eastern inquiry for 500 to 1,000 tons. Prices are nominal at this time. Considerable new inquiry for spot bessemer ferro-silicon for export has appeared, including 3,000 to 4,000 tons for Italy. Doubt is expressed whether enough early metal is available to fill these requests.

(*For complete prices see page* 1232.)

Indian Ore Higher

Philadelphia, Dec. 12.—Higher prices are being named on Indian manganese ore at tidewater principally as a result of freight-rate increases, although the offering supply of ore also is limited. A quotation was made this week in this territory at a shade under 78 cents per unit, at tidewater. One reason for the advance is that lots of ore in recent months have been coming in on liners where more favorable rates were obtained, but this space now is engaged for the first half of 1917 and recourse must be had to regular freight steamers. Reports regarding Brazilian ore prices show considerable variance. A large eastern Pennsylvania consumer reports this ore may be had at around 60 cents per unit, delivered at eastern seaboard. This figure is out of line with that commonly heard in the market and some sellers will not entertain less than 70 cents per unit, while others will not consider that price.

Pipe Contracts

Are Closed for 120 Miles for Shipment to Oklahoma

Pittsburgh, Dec. 12.—Negotiations for 120 miles of 8-inch line pipe for shipment to Oklahoma, previously mentioned by *The Iron Trade Review*, were concluded last week, when contracts were awarded to two pipemakers in this district. About 17,000 tons of material are involved. It develops that three manufacturers, possibly four, will furnish 12,000 tons of iron and 8,000 tons of steel pipe to the Philadelphia Co., Pittsburgh.

Pipemakers are not attempting to sell additional tonnages for shipment the first half of 1917, and some mills actually are out of the market. This accounts for the wide range at which pipe has been quoted recently. Several manufacturers of seamless tubing cannot promise additional tonnages before July, 1918. Deliveries of boiler tubes are deferred from nine to 12 months.

National Acme Contract

The contract for the new plant to be built on East 131st street, Cleveland, for the National Acme Mfg. Co., of that city, has been awarded to George S. Rider & Co., Cleveland, and not to the Austin Co., as stated in these columns last week.

Bar Buyers May Halt

On Account of Germany's Peace Proposal—Premiums Being Paid for Anything Approaching Prompt Delivery

Pittsburgh, Dec. 12.—Reports that Germany had indicated that she is ready to entertain negotiations for peace tended to cause iron and steel manufacturers in western Pennsylvania to await developments before selling or buying additional tonnages. It is too early, however, to indicate what effect the reports of peace will have upon the general situation. Manufacturers of war material declare that the war will not end until the allies have made a more favorable showing on both the eastern and the western fronts.

Steel bars for domestic purposes continue to be quoted at 2.90c by the Carnegie company, but scarcely any tonnage is being sold at that figure. For prompt delivery, premiums of several dollars a ton are being paid. Bar iron makers now are quoting 3.25c and above.

First Quarter's Contracts

Philadelphia, Dec. 11.—First quarter contracts in steel bars from some of the smaller trade continue to be taken by one important independent producer at 3.25c base, Pittsburgh, minimum. In some cases, 3.50c, Pittsburgh, has been quoted. Some of the other producers are not quoting so high, but they are not offering any new contracts. They have been accepting some miscellaneous orders for delivery at mill convenience at 3c, Pittsburgh, and this is their minimum. Specifications are active.

Demand Still Strong

Chicago, Dec. 12.—No essential change has taken place in the situation as to soft steel bars. Demand continues strong and sales heavy, while specifications are being filed in large volume. One important seller in this territory found its bookings during last week unusually heavy.

Hard steel bars are now being quoted at 2.75c to 3c, Chicago mill, but makers are selling only as much tonnage as they can make from rails already in their yards, as new supply of raw material is difficult and uncertain.

Bar Iron Advance

New York, Dec. 12.—A second advance of $5 per ton, in bar iron, within a week was put into effect Dec. 8 by eastern producers. The new price is 3c, Pittsburgh, or 3.169c, New York. On Dec. 1 there was an advance of $5 from 2.50c to 2.75c, Pittsburgh. The demand is very active and deliveries constantly are becoming more deferred.

Bar Iron Strong and High

Chicago, Dec. 12.—A decided advance in the quotation on bar iron has taken place in the past week. The former minimum of 2.65c has disappeared entirely, and the quotation at present appears to be 2.85c to 3c, Chicago mill. Some sales have been made at 3.10c. It is not certain that the minimum is absolute at 2.85c, and it is believed that occasionally 2.75c, Chicago, can be done.

Some important mills are not selling, but others are still taking tonnage for first half. Automobile makers have begun to enter the bar iron market for certain parts formerly made in steel, which cannot now be obtained in time for this season's use, and this is adding materially to the demand for this product.

Foreign Demand Increases

Cleveland, Dec. 12.—The demand for shafting for the manufacture of shells has decreased, but domestic demand is active and prices are firm.

Cold Rolled Steel Shafting

Pittsburgh, Dec. 12.—No change has been made in prices of cold rolled steel shafting. Manufacturers are asking from 10 to 20 per cent off the list for future shipment. Most consumers have covered requirements for the first quarter of next year. For second quarter delivery, mills will likely obtain 10 per cent off the list as a minimum.

Hoops and Bands

Pittsburgh, Dec. 12.—Manufacturers of hoops and bands in a position to promise rather prompt delivery, continue to enjoy substantial premiums. The Carnegie company, however, has made no changes in its prices and it continues to quote hoops at 3.25c and bands at 2.90c for delivery at its convenience.

Will Build Large Plant

Montreal, Dec. 12.—The International Mfg. Co., Ottawa, Ont., has been incorporated with $1,000,000 capital stock by John A. Harriss, Rufus J. Patterson and Alfred O. Hoyt, all of New York; Wilfred J. Hawkins, of Montclair, N. J., and others. The company is a subsidiary of the International Arms & Fuse Co., New York. It has secured a site on the north side of Notre Dame street, west of Dominion park, Montreal, and will erect a plant 350 x 750 feet, patterned after the one erected by the British Munitions Co. at Verdune, Que., last spring, and will cost $1,000,000. The company will manufacture time fuses, explosives, shells, etc.

(*For complete prices see page* 1232.)

Cast Iron Pipe

Prices are Again Marked Up—Buffalo May Call for New Bids

New York, Dec. 12.—Eastern cast iron pipemakers again have advanced prices $2 a ton, making the aggregate rise of the market during the past month from $8 to $10. The latest advance, which was effective Dec. 7, places 6-inch, class B, at $41.50, New York, and 4-inch, class B, at $44.50, New York. Buying has not been so active during the past few days, but producers are well booked. The United States Cast Iron Pipe & Foundry Co. submitted the only formal bid on the 2,100 tons for the year's requirements for the city of Buffalo, asking $54.10, delivered, on the 3's; $47.10 on the 4's, and $44.10 on the 6 to 60's. It is probable that this letting will be readvertised. On 500 tons for Bridgeton, N. J., R. D. Wood & Co. quoted $38, delivered, for the 6 to 10's, and $37, delivered, for the 12 to 14's. Providence has taken bids on 200 tons of 6 to 12's, and Worcester, Mass., is in the market for 800 to 900 tons to close Dec. 14. A 1,200-ton lot of 30 to 48's for a contractor's letting at Philadelphia, has been bid upon. Various export inquiries still appear. One of the latest ones to reach the market is for an indefinite tonnage for China.

Cast Pipe Up $2

Chicago, Dec. 12.—An advance of $2 per ton has been made on cast iron pipe, making the quotation on 4-inch and larger $44 to $45 per ton, delivered Chicago, and on 6-inch and larger $41 to $42, Chicago.

Comparatively little business is offering, as most cities have not yet made up their requirements for next year's extensions. Bids will be opened Dec. 12 at Toledo on 1,500 tons, and Jan. 18 at St. Paul on 1,500 to 2,200 tons.

Marked Up $2

Birmingham, Dec. 13. (By wire.)—All cast iron pipe interests are now quoting the following prices: 4-inch, $39; 6-inch and up, $36 with $1 extra for gas pipe. This is an advance of $2 over recent quotations.

Still Higher Sheet Prices

Unprecedented Quotations Are Made and Deliveries Are Very Slow—Christmas Appeal Has Effect on One Seller

Youngstown, Dec. 12.—One sales manager in the Mahoning valley keeps a small black sheet in his office and exhibits it to prospective buyers as a rare and priceless curio. That scarcely is treating the sheet situation too lightly. Purchasing agents for sheet users say that the sales manager above all others is a man who has learned to say no.

Exceedingly small lots of black sheets, for delivery any time in the indefinite future, are selling at from 5c to 5.50c, with most manufacturers quoting the higher price. Blue annealed, for which the demand continues to increase, is quoted on the same basis at from 4c to 4.75c, with the maximum prevailing. Galvanized at from 7c to 7.50c, despite the lowered price of spelter, does not discourage inquirers, except in a few individual cases.

Most of the finishing mills are hardly more seriously affected by the embargo than they have been and are still affected by the shortage of transportation facilities. Where the sheetmaker is dependent upon one railroad, his plight is worse, of course, but it provides him with so much the better explanation to his importunate customers.

Anyone who thinks that the sheet steel market is a hard and cold affair ought to look into it a little. There is real human interest in it, and sentiment even. A toymaker rushing his shops for the Christmas trade implored one valley sales manager to find some way of sending him sheets. And the sales manager did.

Inability to get enough coal is giving the finishing mills, or most of them, serious trouble. Several concerns are keeping expert men right at the mines, to set in motion any and every possible expedient. One mill today had scarcely enough coal to finish the day; it was a toss-up whether enough would be received to enable it to start work in the morning. This concern uses about four carloads a day, and is able to land only a very few cars at a time.

The high prices of production materials are paid without complaint, and the cost necessarily shifted to the consumer of the finished product. Six-cent sheets are in the offing.

Buyers Must Wait

Canton, O., Dec. 11.—Such small lots of black sheets as may be bought in this territory are selling at from 4.75c to 5.25c; blue annealed at from 4.25c to 4.75c; galvanized at from 7c to 7.50c. The lots to be had of each of these finished materials should be discussed in terms of poundage rather than tonnage.

Most of the sheetmakers continue to suffer shortage of bars. But those who have succeeded in buying semi-finished steel are not much better off than those who have been unable to buy enough, for the successful ones cannot get enough sheet bars delivered to keep their mills running at full time. In some mills, loss of time amounts to as much as 40 per cent.

There is a faint silver lining to the embargo cloud. The buyers of finished steel now know definitely that the shippers are hard up against it for cars and facilities for shipment. The embargo has not as yet caused any shutdowns, and will not cause any if the manufacturers can get enough of the materials of production to keep running, but the buyer of sheets simply will have to wait.

New Contract Adopted

Pittsburgh, Dec. 12.—The new contract form advocated for some time by the National Association of Sheet and Tin Plate Manufacturers, formally was approved by members of the society a week ago. Copies of the contract form, which is familiar to readers of *The Iron Trade Review*, have been distributed by members of the organization. The membership includes 24 independent manufacturers of sheets and tin plate located in all sections of the country.

As previously pointed out in these columns, the contract will tend to minimize speculation and to protect buyers and sellers. Under the special agreement clause, it is provided that: "The buyer's failure to furnish specifications * * * shall be deemed a refusal to accept the tonnage unspecified, which thereupon shall be deducted from the contract; and the buyer shall pay to the seller, as liquidated damages and not as a penalty, the difference between the contract price of such material * * * and the market value thereof at the time of such failure; but such damages shall not be less than 10 per cent of said contract price." In addition, the agreement says that: "If the buyer shall have furnished complete specifications * * * and shipments are not made by the seller * * * the tonnage which the seller has failed to ship shall be deducted from the contract and the seller shall pay to the buyer * * * the difference between the contract price * * * and the market price thereof at the time of such failure; but such damages shall not be less than 10 per cent of said contract price."

Disputes arising with reference to prices shall be settled by quotations offered by *The Iron Trade Review* and *The Iron Age*.

High prices continue to feature the market for sheets. Bessemer black sheets are being sold all the way from 4.50c to 5.50c, base; an eastern Ohio maker sold a couple of carloads of material at 5c, base. Galvanized stock, which is scarce, is commanding from 6.25c to 7.50c, and blue annealed sheets, are quoted at from 3.75c to 4.75c, base. Consumers are attempting to buy tonnage for shipment after July 1, but no tonnage has been offered for third or fourth quarter delivery.

More Than Ever

Philadelphia, Dec. 11.—Leading eastern makers of sheets report they have more business in this product on their books at present than ever before, and orders still are coming in freely. No. 10 gage blue annealed is quoted from 4.25c to 4.50c, Pittsburgh. Higher prices than for domestic account are being named on foreign inquiries, but this does not block orders in that direction, where the inquiry remains active.

Few Are Quoting

Cleveland, Dec. 12.—Very few sheet mills are making quotations. A fair tonnage of odd lots offered for sale by a Youngstown mill was sold rapidly. Cleveland mills are quoting 4.50c on No. 10 black and blue annealed.

Tin Plate Quiet

Pittsburgh, Dec. 12.—Tin plate consumers are manifesting interest in the market for delivery after July 1, next, and it is likely that some mills will accept contracts for shipment the second half of next year at an early date. However, no prices for third and fourth quarter delivery have been suggested. Owing to the fact that most mills have no additional tonnage to sell before July 1, the market is quiet. Some resale tonnage has been offered recently at premium prices.

The Geo. B. Lessig Iron Co., Pottstown, iron manufacturers, has granted an increase of $7.50 to $8 a ton in the puddling rate.

(*For complete prices see page* 1232.)

Flood of Plate Inquiries

Comes From Foreign Sources—Offers to Take Large Tonnages at $100 Per Ton, But Little Business is Accepted

Philadelphia, Dec. 11.—Another flood of huge inquiries for ship steel was turned loose by foreign buyers upon eastern mills the past week, but it has been only in exceptional cases where business has been accepted by the producers or even quotations made, because of heavy order books. In an effort to make the orders more attractive to the mills and to avoid the exacting manufacturing details and the consequent higher prices under Lloyds specifications, some of these foreign buyers have offered to take at 5c, Pittsburgh large lots up to 100,000 tons of ordinary tank steel for ship construction. One eastern Pennsylvania maker in the week was asked to submit prices on lots of foreign ship steel, Lloyds specifications, aggregating 54,000 tons, but quoted only on 10,000 tons for the last quarter of 1917 and then named 6c, Pittsburgh. One Norwegian ship builder asked for 5,000 to 6,000 tons for July-August delivery. Another Norwegian company endeavored, without success, to interest eastern makers in a proposition of 10,000 tons annually for five years with prices to be fixed on a sliding scale. A new inquiry for 10,000 tons for Italy was presented and on 5,000 to 6,000 tons to that country, 6c, Pittsburgh, was named.

One eastern mill declined a bid of 6c, Pittsburgh, on 6,000 tons of ship plates for the third quarter of 1917 because of uncertainty over raw material costs in that period. Another 6c bid was made on 700 tons for 60-day shipment. There were some export sales of ship plates at 6c, Pittsburgh. Some makers quote this as minimum on foreign business; others on both foreign and domestic orders.

Domestic ship steel inquiry has not been so active. Tank plates continue to manifest a wide spread. Universals for delivery in four months are quoted by one mill at 4c, Pittsburgh, but 5c is wanted on sheared. One eastern maker has advanced his tank price to 4.50c, Pittsburgh, and sold 3,000 tons this week at that level. Another eastern mill placed tanks at 4.75c, Pittsburgh, and sold 1,000 tons for shipment at its convenience.

Plate Mills Sold Up

Pittsburgh, Dec. 12.—Manufacturers of steel plates in western Pennsylvania, having no additional tonnage to offer for delivery before July 1, no longer are attempting to figure in the market. They do not want to dispose of their output the second half of next year at this time. The Carnegie Steel Co. and the Jones & Laughlin Steel Co. have made no formal changes in price since the adoption of the 3.50c figure for delivery at their convenience. However, some mills are obtaining 5c and above for prompt delivery.

Builders of steel cars are calling upon plate manufacturers for additional tonnages in order to meet demands of the railroads. Car material is being allotted as equitably as possible, but it is apparent that some of the cars recently ordered cannot be built until the latter part of next year. Approximately 100,000 cars have been purchased since Sept. 1, according to conservative estimates.

Marking Up Prices

Cleveland, Dec. 12.—Eastern plate manufacturers are quoting 5c, mill, or 5.204c, Cleveland, for sheared plates for delivery in one year and from 4c to 4.50c on universal plates for delivery in from 30 to 60 days. It is noted that delivery on universals is being gradually extended. Cleveland companies are also quoting 5c on sheared plates, although this quotation is occasionally shaded somewhat.

Bookings Heavy

Chicago, Dec. 12.—Demand for steel plates for ship building and car construction continues heavy, and it seems probable that all makers may retire from the market in a short time and further bookings will be impossible. Some makers find they carry over into 1917 a large tonnage booked for delivery this year, which it has been impossible to roll with present equipment. One important interest is taking account of its position and probably will find it has sold its entire tonnage of finished steel through 1917 and further selling must be for delivery the following year. A possibility following this situation may be the withdrawal of this interest from the selling market for a considerable period. Plates continue nominally at 3.69c, Chicago mill, for delivery at convenience of the mill.

Renominated.—Officers for the ensuing year were renominated at the meeting of the Philadelphia Foundrymen's Association at the Manufacturers' Club, in that city, Dec. 6. The nominations are as follows: President, Thos. Devlin, of the Thos. Devlin Mfg. Co., Philadelphia; vice president, Geo. C. Davies; treasurer, Josiah Thompson; secretary, Howard Evans, and executive committeemen, Walter Wood, Thos. M. Eynon, H. L. Haldeman, Walter T. Macdonald and W. S. Dunning, of Chester.

(For complete prices see page 1232.)

Warehouse Prices

On Sheets Are Advanced in Chicago and Other Centers

Chicago, Dec. 12.—Although bars, shapes and plates remain at the same quotation in Chicago warehouses, sheets were boosted considerably late last week. No. 10 blue annealed were advanced from 4c to 4.25c, No. 28 black sheets were advanced from 4.60c to 4.75c, and No. 28 gage galvanized from 6.50c to 6.75c.

Sheets Up

Cincinnati, Dec. 11.—Warehouse prices on blue annealed sheets have been advanced to 4.40c, Cincinnati, in comparison with 4.15c last week. Iron and steel bars remain unchanged from 3.70c to 4.25c, and shapes and plates are also the same as last week at 3.80c to 4.35c. Cold rolled bars are given at 10 plus the list price. Business is good, and as dealers are having a hard time securing shipments from mills, warehouse stocks are low.

Higher at Cleveland

Cleveland, Dec. 12.—Prices on sheets have been advanced $10 on galvanized, $5 on black and from $2 to $7 on blue annealed. Prices are now as follows: No. 28 galvanized, 6.50c; No. 28 black, 4.75c; No. 10 blue annealed, 4.25c to 4.50c. Tin plate has been advanced $1 per base box and is now quoted at $15.

Cleveland Foundries Advance Wages

Cleveland foundrymen have advanced wages of iron molders to $4.50 per day, effective Jan. 1. The prevailing wage has been $4 and a strike has been in progress at some plants, with a demand for $4.75. It is believed that the compromise rate will prove satisfactory and that there will be no further trouble. The 9-hour day will continue to prevail in Cleveland.

In Detroit, a compromise has been arranged by employers and molders on a basis of $4.25 per day to April 1 and $4.50 from April to November.

Forging Billets

Command Fancy Prices—All Crude Steel Scarce

Philadelphia, Dec. 11.—Remarkable prices are being quoted, bid and obtained for semi-finished steel in eastern territory where the scarcity of salable tonnage grows more acute steadily. Forging billets are reported to have brought $85, mill, and some makers now ask that. A large eastern Pennsylvania maker quoted $80, mill, on a recent inquiry for 1,000 tons of 0.60 and over carbon billets, 5½ inches square, and now wants more for steel of this quality. A fair-sized sale of forging bloom crops was made by an eastern producer to a nearby consumer at $65, mill. This same producer, after recently quoting $45, mill, for shell steel discards, has withdrawn entirely from the latter market. It is next to impossible to obtain open hearth rerolling billets for 1917 from eastern makers, as they are sold up so that with the moderate tonnage reserved in the late year for regular customers, they are virtually out of the market. On this steel, $60, mill, is the nominal quotation. One buyer in vain offered to take 10,000 to 12,000 tons of 5-inch billets for all of 1917. More or less inquiry for ingots continues. Electric steel ingots from the south are offered here at from $55 to $56, delivered, but the sizes are not suitable to all buyers. On wire rods, export bids of $80, mill, have been declined by a large independent maker.

Sold Far Ahead

Buffalo, Dec. 12.—Producers report that the demand for billets continues strong and that one interest has sold its entire output, to the limit of its capacity for the first half of 1917, and has declined to quote on billets beyond that time.

Consumers Cover Needs

Pittsburgh, Dec. 12.—Leading manufacturers of semi-finished steel products, including billets and sheet bars, have taken care of their regular customers for the first quarter, and in some instances, for the second quarter of 1917. No tonnage, however, has been sold for shipment after July 1, next, so far as can be learned. Billets and sheet bars for nearby shipment are being held at $60 and above, but it is not likely that consumers protected by long-term contracts paid anything like that figure for material for shipment in January, February and March. Prices named in sliding scale contracts, however, have no effect upon the market for prompt delivery. Some tonnage for shipment in the first quarter has commanded above $56, mill. Demand for both billets and sheet bars continues exceedingly heavy and some finishing departments have been forced to shut down temporarily, on account of the scarcity of steel. Wire rods now are being held at $70 a ton, or $5 a ton above the previously prevailing minimum price. Muck bar nominally is quoted at $50, mill.

No Sheet Bars

Youngstown, O., Dec. 12.—Of the sheet bar market in this part of the country it may be said that there isn't any such thing, at least as to the first half of the coming year. Very small lots here and there are sold at from $62 to $65; the conversational market minimum is $60.

One sheetmaker appealed to another, who had succeeded in landing a fair-sized tonnage, to split his haul with him, and offered $70. The two manufacturers were friends, and the successful purchaser wanted to help, but he regretfully informed the unfortunate sheetmaker that for the present he could not qualify as a friend in need.

The embargo, if it continues for very long, is certain to cut off further the lines of communication between the semi-finishing and the finishing mills.

Cold Rolled Strip Steel

Pittsburgh, Dec. 12.—Prices of cold rolled strip steel are hardening. Indications are that quotations below 7c, base, will disappear before Jan. 1. While manufacturers have not opened books for second quarter delivery, they have enough tonnage on hand to maintain present operating rates well into the second quarter of the year.

Nuts, Bolts and Rivets

Pittsburgh, Dec. 12.—It is likely that prices of nuts, bolts and rivets will be advanced at an early date. Demand is described as heavy, although new buying is comparatively light. Ship builders and car builders continue to be conspicuous buyers.

Chain Advanced

Pittsburgh, Dec. 12.—Steel chain now is being held at 6c for ⅜-inch proof coil, or $5 a ton above the previously prevailing price. Demand is fairly heavy, but enough tonnage has been sold recently to establish the 6c figure.

(*For complete prices see page* 1232.)

Shell Steel

Negotiations Proceeding Actively Despite Talk of Peace

New York, Dec. 12.—Despite the impetus to the talk of early peace given by the definite proposals from Germany, negotiations for another huge tonnage of shell steel by domestic munition makers, aggregating 400,000 to 500,000 tons, which were opened during the past week, are going forward. These new inquiries have followed closely upon the placing directly by the French and British governments several weeks ago of an enormous total of shell blooms and billets for the last half of 1917 and early 1918 delivery, which has been estimated by 1,500,000 tons and upward. Whether these requests of domestic shell makers represent requirements for new munition contracts just placed or still under negotiation or whether they are uncovered portions of previous contracts, is not clear. Among the inquiries in the market is one for 100,000 tons from a shell maker in this territory; another for 75,000 to 100,000 tons for a castings company and about an equal amount for an affiliated interest and a third for 100,000 to 150,000 tons for a middle western consumer. Deliveries in some cases are wanted throughout next year beginning in the first half and in others from April to November. The sizes called for range from 5⅛ and 6-inch rounds to 7½-inch squares. Some of the steel makers have been unable to make quotations upon these inquiries on account of their filled-up condition. In addition to domestic inquiries, there have been some new offers of business for export including one of 35,000 tons. A few scattered sales of munition steel of a special character have been made within the past week to one of the foreign governments.

Wire Advance

Of Not Less Than $3 Per Ton is Expected at Early Date

Pittsburgh, Dec. 12.—An early advance of not less than $3 a ton is predicted by manufacturers of wire products in this district. Material is being sold without difficulty at prices adopted Nov. 24 and some tonnage has commanded premiums of $2 and $3 a ton. Most manufacturers are selling only for 30 days' delivery and consumers are able to get only about 50 per cent of their estimated requirements. Rather heavy demand exists for export, but no large tonnages have been placed recently in this district.

Heavy Sales of Scrap

Are Made in the Cleveland District—Prices Advance Rapidly at Buffalo, Birmingham and Other Points

Cleveland, Dec. 12.—After recording probably the largest value of a day's transaction in iron and steel scrap ever made by one Cleveland dealer, the market is quiet and firm. At least two and possibly three of the leading local consumers purchased from one dealer over 30,000 tons of heavy melting steel at $27 to $27.50, for delivery over the next three months. Three sales supplemented by others made the day's value of sales run close to $1,000,000. Other dealers also sold tonnages to the same mills, it is understood. These consumers consequently withdrew from the market and are offering much less than they had previously paid. Dealers who are covering on the sales are offering about $25 for the material that might be purchased to fill orders.

Foundry scrap softened considerably during the past week due to a large volume of offers coming from other points. Stove plate and grate bars then declined. Machine shop turnings and cast borings also suffered declines due principally to a quieting of the demand in the valleys and the Pittsburgh district. Steel axles have been sold at $50 a gross ton, and now are held at $55.

On the whole, relatively unimportant changes have taken place in prices during the week, and the coming holidays preclude any further great deviation either upward or downward, according to the best judgment able to be found.

Record Breaking Prices

Philadelphia, Dec. 11.—Record-breaking prices for steel scrap, the highest the east has ever known, are being paid freely and the rising movement continues. The Pennsylvania railroad on its steel scrap offerings for November obtained the highest prices in its history, or from $25 to $30, delivered along its line. The volume of buying in the market is not quite so heavy as recently. There have been no late sales of heavy melting steel for eastern Pennsylvania shipment, but offers of $25, delivered Johnstown, and $26 and higher, delivered Pittsburgh, are being freely made in the east. Eastern iron mills have been closing for good lots of No. 1 railroad wrought and have paid $28, delivered. Higher prices within a few days are indicated.

A fire has broken out in the borings and turnings stock pile of the Bethlehem Steel Co. at South Bethlehem, so that this buyer is unable to take in new shipments and is out of the market where recently it has been active. Rerolling rails are scarce. Low phosphorus crops have been quoted at $36, eastern mill.

Pittsburgh Prices Jump

Pittsburgh, Dec. 12.—Twenty-eight dollars a ton has been paid for heavy melting steel in this district. One melter paid that figure for 2,000 tons and another consumer bought about 10,000 tons several days ago at $27. Several middlemen now are asking $30 for this grade. It is understood that some of the tonnage recently sold by the Pennsylvania railroad commanded $27.50. Rerolling rails have sold at $34, or $4 a ton less than the price of standard bessemer sections. Malleable scrap is being held at $21 and bundled sheet scrap at $16 a ton. Low phosphorus steel scrap is selling at a range from $30 to $32. Machine shop turnings and borings reflect strength, but are unchanged in position. No. 1 cast scrap has advanced 50 cents a ton. Several of the more prominent consumers in this district have been figuring in the market. The Carnegie Steel Co. has not bought any heavy melting stock recently.

High Buffalo Prices

Buffalo, Dec. 12.—Prices on practically all the commodities in the old material line have advanced with the turn of the past week and a number of the leaders, such as heavy melting steel, low phosphorus, railroad machine cast, No. 1 busheling, car wheels and stove plate have advanced from 50c to $2 a ton since morning. Heavy melting is now being sold at $26 to $27. Demands from outside of the district are cutting into the usual supplies of scrap obtainable in the Buffalo territry. In some lines this has gone on to the extent of creating shortages. The supply of all lines seems to be well below the persistent demand.

Still Rises

Chicago, Dec. 12.—Although iron and steel scrap has attained levels probably never before met, there seems to be no limit to the advance and increased quotations are being brought out constantly. Shortage of freight cars is one factor which produces an apparent shortage and the reduction of tonnage offered by railroads adds to this condition. Consumers are buying steadily regardless of cost and all these factors tend to carry prices to much higher levels.

It is interesting to note that rerolling rails are now quoted considerably above the original cost of the rails, so that railroads practically get the use of the rails during their lifetime at no cost. Heavy melting steel is being quoted at $23.50 to $24, with other heavy grades at corresponding levels and No. 1 railroad wrought at $26.50 to $27. A slight weakening has been noted in No. 1 busheling, as an unusual supply has been thrown on the market during the past few days. It is not certain whether this condition will continue more than a few days.

Railroad offerings are still small, and at present include the following: Santa Fe railroad, 2,840 tons; Southern railroad, 1,900 tons; the Monon railroad, 1,400 tons, and the Soo line, 1,200 tons.

Scrap Advancing

Cincinnati, Dec. 11. — Continued good demand from surrounding territories is causing the iron and steel scrap market to advance rapidly. Today prices are from $2 to $3 a ton higher than they were last week, and the indications are that better figures will be realized in the next few days. Sales are principally to melters in surrounding territories, as consumption in and around Cincinnati is far below supply. This is because large melters are few in this district. Heavy melting scrap today is selling from $21 to $22 per gross ton. No. 1 machine cast is given from $16 to $16.50, No. 1 yard wrought from $17 to $17.50, cast borings from $9 to $9.50, and machine shop turnings from $8.50 to $9, all per net ton.

Active at St. Louis

St. Louis, Dec. 11.—Last week was one of continued activity in the scrap market in this locality, and all grades broke records for high prices. The increased demands of the consumers, coupled with light offerings by the railroads, tended to push scrap to hitherto unheard of prices. Another reason for the advance in some grades was the fact that the Colorado Fuel & Iron Co. has been quietly buying scrap from this market for the last few weeks. This was especially the case of cast iron car wheels, and heavy purchases by that concern sent the price of this grade of scrap to above $25 a gross ton, with a possibility that car wheels will reach $30 a gross ton within a very short time.

(*For complete prices see page* 1232.)

The railroad offerings for the week are: Southern, 2,150 tons; Union Pacific, 950 tons; St. Louis-Southwestern, 200 tons.

Highest on Record

Birmingham, Ala., Dec. 11.—The scrap iron market experienced two or three raises during the week, until present prices are at the highest levels known in the district. Sales are not heavy, due to the great shortage of scrap. Many of the holders of scrap in the south are still unwilling to sell, believing that prices will go higher. Dealers have made some very enticing offers which have failed to interest the saw mill, furnace and other accumulators of scrap iron. The railroads have been supplying the foundries with some heavy shipments of miscellaneous scrap to apply on their purchases of castings.

Advance at Toledo

Toledo, O., Dec. 11.—The scrap market shows a substantial advance for the past two weeks, and dealers fear a shortage of old material. Heavy melting and shoveling steel is quoted at $21, No. 1 busheling $18.50, cast iron $19, stove plate $15, all quotations f. o. b. Toledo, net tons. Scrap dealers expect a still further advance in the market and the tendency is toward light shipments.

Coke is Quiet

Some Furnaces May Be Banked During the Holidays

Pittsburgh, Dec. 12.—The market for Connellsville coke has been rather quiet the last 10 days. It is understood that some blast furnace managers plan to bank stacks during the holidays in an effort to relieve the congested traffic situation. Forty-eight hour fuel for spot delivery is selling at from $7.50 to $8.25 a ton. For delivery next year, dealers are asking $5 a ton, but no sales have been made recently. It is not believed, however, that fuel could be obtained at prevailing prices, which are regarded as nominal. Demand for foundry coke is fairly heavy, but prices are unchanged. *The Connellsville Courier* for the week ending Dec. 2 says production was 419,377 tons, compared with 408,169 tons the week before.

High Eastern Prices

Philadelphia, Dec. 12.—Spot sales of Connellsville furnace coke continue to command high prices from eastern furnaces. One seller disposed of 30 cars in the week at $8.25, ovens, and another of 10 cars at $7.75, ovens. The supply is scarce. Some makers of spot Connellsville coke ask $10, net, to them, and small sales at $10.50, ovens, have been made by middlemen in eastern territory. Some spot foundry coke, not regarded as strictly standard, is available at $9.50, ovens.

Sales Active

Cincinnati, Dec. 11.—A good tonnage of foundry coke is being sold for shipment over the first half of 1917, and also throughout the whole of next year. Prices for the first six months of 1917 range from $7 to $8, ovens, and from $5 to $6 for the whole year. The majority of sales are for the latter shipment. No furnace coke is available, except occasional lots for spot shipment, which are bringing good premiums.

High Foundry Prices

St. Louis, Dec. 11.—Three car lots of coke were sold last week, foundry grades bringing from $10 to $11 a ton for prompt delivery, and another sale of 600 tons of foundry coke was made. Makers of by-product coke are not quoting prices, and are refusing orders from sources outside of this market, because of the fact that the local demand is quite up to the supply.

Ferro Quiet

Pittsburgh, Dec. 12.—Reports are heard of ferro-manganese being offered at slightly less than prevailing quotations, but no large tonnages have been sold recently in this district. One seller of spiegeleisen has advanced his minimum price to $55, furnace, but not much tonnage is being sold. Lower grades of bessemer ferro-silicon are being held on the basis of from $40 to $42, furnace, for No. 10 per cent. Most consumers have covered requirements for the first and second quarters of next year.

Benner Returns

Samuel A. Benner, formerly general manager of sales of the Carnegie Steel Co., and now connected with the American Steel Export Co., New York, was the guest of honor at a dinner given by the latter company, at the Waldorf-Astoria, New York City, Dec. 11, upon the occasion of his return from an extensive business trip through Europe. Mr. Benner was abroad several months and investigated iron and steel trade opportunities in various countries. During the evening, H. W. McAteer, president of the American Steel Export Co., was presented a bronze match stand and ash tray by his associates.

(For complete prices see page 1232.)

Ore Shipments

Make New Record for December—Season Virtually Ended

Cleveland, Dec. 13.—The wonderful record-breaking season of 1916 on the lakes has virtually ended. Insurance on all vessels expired at midnight Dec. 12, and very few boats will be loaded this week. It is estimated that the shipments for December will amount to at least 800,000 tons and may be as much as 1,000,000 tons. The December movement is by far the heaviest in the history of the lakes. In many years there has been no shipments after Dec. 1, and last year the total was only 57,236 tons. Next to this year, the December shipments for 1909 were the largest, being 519,525 tons. In that year the total lake movement was 41,681,873 tons. If the December lake shipments amount to 1,000,000 tons and the all-rail shipments to the same tonnage, the total shipments for the 1916 season will be 65,650,000 tons.

Ore on lower lake docks Dec. 1, 1916, was 9,958,306 tons, compared with 8,812,499 tons on dock Dec. 1, 1915.

Lake Erie Ore Receipts

Out of a total of 5,715,452 tons of ore shipped during November, 5,055,239 tons were received at Lake Erie docks, as follows:

	1916.	1915.
Buffalo	726,448	625,813
Erie	266,764	138,165
Conneaut	808,066	725,295
Fairport	231,328	188,834
Ashtabula	1,088,587	1,066,031
Cleveland	948,497	948,249
Lorain	494,822	301,030
Huron	127,053	60,833
Toledo	293,292	201,745
Detroit	70,382	52,300
Total	5,055,239	4,308,295

Will Make Tank Steel Cars

The Allegheny Steel Tank Car Co., incorporated under the laws of Pennsylvania, has been formed to manufacture steel tank cars at Warren, and has purchased the plant and equipment of the Allegheny Foundry Co. The plant is to be opened in the near future, with a payroll of about $100,000. The authorized capital stock is $100,000.

H. D. Kopf, president of the Hammond Iron Works, is president of the new corporation; J. A. Schofield, vice president; G. L. Craft, secretary; and A. J. Hazeltine, treasurer. On the board, besides Messrs. Kopf, Craft and Hazeltine, are H. A. Logan and U. G. Lyons.

Announcement of the new company's plans was withheld until after the sale of the foundry plant was confirmed by E. E. Beshlin, referee in bankruptcy.

Shape Prices Advanced

And Buying is Slightly Checked, But Bookings Are of Considerable Volume—Export Booking Large

Philadelphia, Dec. 11.—Two leading eastern Pennsylvania shapemakers adopted during the week another advance of $5 per ton and now are quoting 3.50c, Pittsburgh base, or 3.659c, Philadelphia. These advances appear to have been made primarily to shut off buying, as these mills have been pressed with large tonnages recently, which their obligations have not justified their taking on. The indications are that these prices are checking smaller undertakings. Sales of standard sections at 3.50c, Pittsburgh, have been light, but the bookings in special shapes, especially in rolled columns, by one leading eastern mill have been considerable at the new base figure. Another large independent producer is quoting 3.25c, Pittsburgh, but this is practically nominal. There is considerable shape inquiry from western buyers which eastern mills are less disposed to follow. Export offerings are large and numerous.

Structural Shapes Still 3c

Pittsburgh, Dec. 12.—Despite contrary reports, the Carnegie Steel Co. continues to quote structural shapes at 3c, for delivery at its convenience. Fabricators are specifying briskly for material and are complaining about deferred shipments. Builders and erectors are calling upon warehouses for heavy tonnages in order to complete work in specified time.

Shape Demand Continues

Chicago, Dec. 12.—Inquiry and sales of structural shapes continue, although orders placed now mean delivery probably early in 1918. The use to which these shapes will be put is largely commercial rather than structural, except for bridges and industrial construction. The quotation remains nominally unchanged at 3.19c, Chicago mill. Practically no business of importance was closed in the west last week on structural projects, even railroad construction being unrepresented.

CONTRACTS AWARDED.

Bridge work for the Pennsylvania railroad, 1,300 tons, to the American Bridge Co.

New erecting shop of the Standard Shipbuilding Co., Staten Island, 750 tons, to the Blaw Steel Construction Co.

Power house at Lowelville, O., 500 tons, to the Pittsburgh Bridge & Iron Works.

Public school on 183rd street, New York City, 275 tons, to the American Bridge Co.

Extension to the plant of the John A. Roebling's Sons Co., Trenton, N. J., 2,500 tons, to the McClintic-Marshall Co.

Subway section under city hall, Philadelphia, 800 tons, general contract to the Keystone State Construction Co.

Building for *The Syracuse Herald*, Syracuse, N. Y., 450 tons, to Milliken Bros., Inc.

The H. Koppers Co., for work for the Colorado Fuel Co. and the Maryland Steel Co., 2,500 tons, the McClintic-Marshall Co.

For relining water reservoir to West Side Filtration plant, Cleveland; 760 tons reinforcing bars. General contract, $328,000, John F. Casey Co. This exceeds original cost of $300,000.

CONTRACTS PENDING.

Reinforcement of the Lehigh & New England bridge, at Poughkeepsie, 2,300 tons, Stroble Construction Co. low bidder.

Pier in South Brooklyn, for City of New York, 1,100 tons, bids pending.

Addition for the Baltimore Enameled & Novelty Co., Baltimore, 300 tons, bids pending.

A building for the Lycoming Rubber Co., Williamsport, Pa., 200 tons, bids pending.

Terry street pier, Philadelphia, about 3,000 tons, bids to be taken by the city Dec. 19.

Industrial plant construction, Lancaster, Pa., 1,200 tons, postponed indefinitely.

Extension to the power plant of the Edison Co., Boston, 1,200 tons, bids being taken.

Four substations for the Interborough Rapid Transit Co., New York City, 750 tons, bids being taken.

Car Buying

For Delivery in 1918 Does Not Yet Include Pennsy's Order

New York, Dec. 12.—Delay of the Pennsylvania railroad in placing orders against its inquiry for 205,000 tons of 100 and 130-pound rails for 1918 delivery has given rise to reports that some difficulty has been encountered in getting those mills which usually fill this business, to accept the contracts at $40, mill. This system has deferred several times the closing of bids. It is understood that some of the independent producers are reluctant to commit themselves on a large tonnage so far ahead on the ground that costs in 1918 are so uncertain and may be much greater than at present anticipated. It is known, however, that some of the mills have quoted the Pennsylvania on definite tonnages.

Car buying is quieter. The Los Angeles & Salt Lake has closed for 1,000 general service with the Pressed Steel Car Co., and the Minneapolis & St. Louis for 1,000 box with the American Car & Foundry Co. The latter did not buy 500 of other types. Another road awarded 500 cars.

(*For complete prices see page* 1232.)

Foreign buying again has figured prominently in the locomotive market. The Russian government has placed an additional 100 locomotives with the Baldwin Locomotive Co., making its total recent order with that builder 140. The Norwegian State railways ordered 22 locomotives of the same builder. The Florida East Coast bought 12, the Erie 10 and the Maine Central two, all from the American Locomotive Co. The Duluth, Messabi & Northern placed six with the Baldwin Locomotive Works.

New Spike Prices

New York, Dec. 12.—Leading makers of standard spikes have advanced their product $13 a ton. Standard railroad spikes which formerly were at 2.75c, Pittsburgh, net, now are quoted at 3.40c, net. Railroad spikes 7/16 x ½-inch are at 3.50c, base, and 5/16 x ⅜-inch at 3.75c, base. Bolt spikes are at 3.65c, base. Eastern producers also have been advancing spike prices and in track bolts they have raised their schedule, $10 a ton, to 5.10c, mill. The Lehigh Coal & Navigation Co. is inquiring for 2,000 kegs of spikes for first half.

Spikes Advance Sharply

Pittsburgh, Dec. 12.—Standard railroad spikes, which had been offered at 2.65c, or $5 a ton below the price of steel bars, now are being held at 3.40c, Pittsburgh, and 3.50c, Chicago, by leading makers in western Pennsylvania. Manufacturers declare they will not sell spikes unless they can obtain prevailing prices.

Spikes $13 Higher

Cleveland, Dec. 12.—Railroad spikes, on which the usual quotation has been 2.75c, have been advanced to 3.40c, or $13 per ton, the largest advance on record. Spikes for some time have been lower than other materials and there has been practically no selling. With the revival of demand, prices were marked up in keeping with those of other products.

Car Buying Renewed

Chicago, Dec. 12.—After a lull, railroads are again placing orders for rolling stock. The Minneapolis & St. Louis railroad has ordered 1,000 box cars from the American Car & Foundry Co., and 500 hoppers from the Haskell & Barker Car Co. The Northern Pacific railroad has bought 500 automobile cars from the Haskell & Barker Car Co.

The Union Pacific railroad is inquiring for 2,500 refrigerator cars for the Pacific Fruit Express.

Railroad Embargoes

Are Very Serious at Cleveland—Plants May be Closed

Rolling mills, steel works and other industrial plants in the Cleveland district are in imminent danger of closing down. Blast furnaces in that territory are threatened with likelihood of being banked. But Cleveland is not alone in this regard since other manufacturing cities in northern Ohio are in much the same condition.

Railroad embargoes primarily aimed to aid car movements were the first cause of this extraordinary condition of industrial affairs in this section of the country. These embargoes principally were declared to prevent further movements of loaded cars eastward in the effort to drive empty cars westward. However, it appears the railroads have issued embargoes right and left until today the entire freight car situation has become almost hopelessly tangled. Railroad officials themselves seemingly are unable to unravel the tangle, and fewer cars are being moved every day than in the preceding 24 hours.

This strange condition in transportation has resulted in shortages of coal and coke moving to works which must have fuel, and some of them are barely able to operate today. This is true of certain blast furnaces as well as rolling mills and foundries. Movement of finished iron and steel, pig iron, castings, etc., from works outward bound, no matter whether for shipment east or west, north or south, has almost ceased. Works managers have been reduced to the necessity of figuring on car movements vital to works operation almost from hour to hour.

Lines like the Pennsylvania system are refusing point blank to move cars from one works to another within the city limits even when the cars actually are loaded and standing on the mill side track. In one case of foundry in one section of Cleveland had a car standing loaded with castings for Detroit, and the Pennsylvania refused to move them, or even transfer the car to the Wheeling & Lake Erie, which offered to accept the shipment, intending by a roundabout route to get it to Detroit. The castings had to be teamed through the city to the Wheeling & Lake Erie tracks before they could be started on their way. One mill has coal in cars on sidetracks inside the city, but cannot get it moved to the plant.

The Pennsylvania railroad stated to *The Iron Trade Review* that no carloads are taken to connecting or from connecting lines. No immediate relief is in sight, although the situation is far from being as serious as played up in the daily papers. "We are endeavoring," said an official in the traffic manager's office, "to handle all perishable freight immediately upon its receipt and so far we have gotten things through on schedule time. The iron and steel industries have been hit to a certain degree but we are not handicapped to anything like the extent some people report."

A report from the Baltimore & Ohio gave evidence of optimism: "We are in much better shape than a week ago, though embargoes on iron and steel products exist to and from some points. We have endeavored to accommodate blast furnaces and steel plants on our lines and will continue to give them all we have." The traffic office of the Nickel Plate stated that while the iron and steel industries had been hard hit, the situation was improving. "The eastern railroads," state a Nickel Plate representative, "hold the cards." Export shipments have been delayed, but westbound freight is and always has been open, according to statements from the Nickel Plate. Local switching has been delayed to a certain degree.

The Big Four announced that it was accepting 20 cars a day and that the situation, while far from normal, was improving day by day.

Coal Lands

Held by J. V. Thompson Purchased by H. C. Frick Coke Co.

A. C. Robinson, chairman of the Josiah V. Thompson creditors' committee, on Dec. 9, announced the sale of 12,000 acres of coal lands held by Mr. Thompson in Greene county, Pennsylvania, to the H. C. Frick Coke Co., a subsidiary of the United States Steel Corporation. The Frick company paid from between $6,000,000 to $7,000,000 for the acreage. Mr. Thompson stated that other important negotiations for sales of coal lands are under way. Mr. Thompson owns 58,403 acres of coal lands in Greene county, valued by appraisers at $32,647,900.

The First National bank of Uniontown, Pa., of which Mr. Thompson was president, closed its doors in January of 1915, and Mr. Thompson, some time ago, was indicted by the federal grand jury for alleged wrongdoings in connection with the affairs of the bank.

The creditors' committee has been working for nearly two years, but no definite progress was reported until last week. People in close touch with the committee say all of Mr. Thompson's obligations will be met.

Coke By-Products

Domestic Dyemakers Place Orders for Toluol

New York, Dec. 12.—More large contracts in benzol and toluol have been closed during the past week, which further has improved the undertone of the market by reducing the visible supplies. Bottom prices, especially in toluol, where $1.50 and $1.75, per gallon, on large contracts, recently was done, seem to have been struck. Many of the large contracts have been with domestic manufacturers of products not related to war. In toluol, domestic dyemakers have placed some orders calling for 50,000 to 75,000 gallons each, and there is a report that an Ohio chemical company which manufactures dyes was the buyer of 50,000 to 100,000 gallons. Foreign governments have bought large quantities of toluol, much of which is to be shipped to Canada for trinitrotoluol manufacture, especially for the British government. Production of trinitrotoluol in this country in 1917 promises to be lighter than in 1916. The toluol available for the first half of 1917 now largely is sold. Spot buying is fair at from $2 to $2.50 per gallon. Rubber manufacturers have taken large lots of benzol recently and the expected 1917 output has been absorbed materially. Probably two-thirds of the 1917 capacity now is under contract. Both spot and contract product is held at 55 cents per gallon. Spot phenol is scarce and it is estimated current supplies available are not over 120,000 to 150,000 pounds. Spot phenol is from 55 to 60 cents per pound, and contract at 55 cents. Solvent naphtha is inactive and weak at 25 cents, nominally, which could be shaded on large orders. Sulphate of ammonia is unchanged in price this week, but the demand remains in excess of the supply.

Market Prices for Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.

Pure benzol	$0.55
Toluol	2.00 to 2.50
Solvent naphtha	.25

Per Pound at Producers Plant.

Phenol	$0.55 to 0.60

Per 100 Pounds at Seaboard.

Sulphate of ammonia	$3.95 to 4.00

Contract.

Per Gallon at Producers Plant.

Pure benzol	$0.55
Toluol	1.75 to 2.00
Solvent naphtha	.25

Per Pound at Producers Plant.

Phenol (nominal)	$0.55

Per 100 Pounds at Seaboard.

Sulphate of ammonia (nearby)	$3.95 to 4.00

Wage Increases

The Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has posted an advance of 5 to 10 per cent increase in the wages of its employes, effective Dec. 11.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

JUSTICE GRUGAN, formerly general manager Northern Ore Co., operating large zinc properties at Edwards, N. Y., has resigned and has opened an office at No. 621, 30 Church street, New York City, as a mining engineer and will specialize in the examination of ore properties and prospects. Mr. Grugan has had a long experience as an examining engineer. Before going with the Northern Ore Co., he served for a number of years with the Worth Bros. Co., Coatesville, and in behalf of the latter investigated iron ore deposits in Cuba, South American and other countries. He has been succeeded as general manager of the Northern Ore Co. by W. D. Blackmer.

C. J. Houck has been appointed superintendent of the malleable foundry of the Timken-Detroit Axle Co., Canton, O., to succeed the late S. J. Campbell.

Meyer Davis, formerly chief engineer of the Asbestos Protected Metal Co., Pittsburgh, has been appointed manager of its San Francisco office, located in the Hobart building, effective Dec. 15.

Francis M. Shields, cost manager of the American Optical Co., Southbridge, Mass., sailed from New York, Dec. 5, for England, by way of Copenhagen, where he will represent the company.

Arthur V. Farr, who has been for the last three years advertising manager of the S K F Ball Bearing Co., Hartford, Conn., has accepted the position of sales manager of the Hess Steel Corporation, Baltimore.

Clyde E. Tousley has been promoted from the sales department to manager of the service department of the Trumbull Steel Co., Warren, O., succeeding J. Fearnley Bonnell, who has been transferred to the sales department.

James Duncan Livingston has been appointed president of the Mayo Radiator Co., New Haven, Conn., by the directors, to succeed Virginius J. Mayo, who founded the business. E. B. Shoemaker has been elected vice president and general manager of the company.

A. L. Sonnhalter, who for the past year held the position of chief chemist and metallurgist with the Page Woven Wire Fence Co., Monessen, Pa., has resigned to accept a position as assistant superintendent, open hearth department of the United Alloy Steel Corporation, Canton, O.

Robert F. Crudington, for the past two years superintendent of the Nation Brass Co., Grand Rapids, Mich., has accepted the position of general superintendent of machine manufacture at the American Graphophone Co., Bridgeport, Conn., which city he left 14 years ago to go to the Monarch Typewriter Co., Syracuse, N. Y., as mechanical engineer.

J. W. Bass has been appointed works superintendent of the Universal Plow Co., Florence, S. C. Three months ago, Mr. Bass accepted a position as superintendent of this company's plant, prior to this time having been affiliated with the malleable casting works of the Stanley G. Flagg Co., Stowe, Pa., in the capacity of general foundry foreman.

Stephen J. Anderson, who has been with the Norton Co., Worcester, Mass., eight years, recently doing special demonstration work, will leave for Japan immediately after the first of the new year where he will take a position with its agents, the F. W. Horne Co., Tokio, the duties of which will be exclusively with Norton grinding wheels.

W. V. D. Wright, who was treasurer of the Inter-Ocean Steel Co., Chicago, up to the time of its merger with the Railway Steel Spring Co., New York, and who since that time has been in charge of their sales in the Chicago district, has resigned to become a vice president of the Edgewater Steel Co., which is now constructing a plant at Pittsburgh for the manufacture of locomotive tires and rolled steel wheels.

N. B. Ford, who for 10 years traveled for the Corbin Screw Corporation from its Chicago office, having his headquarters in Kansas City, and who left two years ago to become connected with the Ford Chain Block & Mfg. Co., Philadelphia, has re-entered the employ of the Corbin Screw Corporation as salesman, with headquarters in New Britain, and covering the territory formerly traveled by A. H. Harrop.

D. B. Gehly, at present secretary and treasurer of the Cambria Steel Co. and secretary of the Midvale Steel & Ordnance Co., has been made secretary of the Midvale Steel Co., Worth Bros. Co. and the Wilmington Steel Co., to succeed D. M. Deemer, resigned. Mr. Gehly also has been made treasurer of the same companies, succeeding W. C. Mac Farland, resigned. These changes were acted upon at a meeting of the directors of the Midvale Steel & Ordnance Co., Dec. 5.

R. C. Parsons has been appointed superintendent of the rail and structural mills, and the slab mill at the Steelton plant of the Bethlehem Steel Co. A. A. Burke was made assistant to Parsons. Frank Kelly, who had charge of the slab mill, was appointed superintendent of the rail and structural mill, and T. J. Bittner was made superintendent of the 14 and 35-inch rolling mills.

W. C. Stevens has been appointed sales manager of the Cutler-Hammer Mfg. Co., of Milwaukee. He has been connected with the Cutler-Hammer company about 10 years, the last three years of which he has been in charge of the New York office. Mr. Stevens graduated from Cornell in 1906 with the degree mechanical engineer and at once took up the shop, testing room and engineering course at the Milwaukee factory. The latter part of 1907, he was sent to the Pittsburgh office, in which field he devoted his time to sales-engineering and installation work. Much of the installation and experimental work connected with controlers for the steel plants and unloading plants was done under his supervision. After eight months of 1909 spent in work outside the Cutler-Hammer company, Mr. Stevens returned to the Milwaukee works. For the next four years his time was spent in engineering and sales work pertaining particularly to the steel mill industry, hoist work, etc. In 1911 he took temporary charge of the Chicago office during the absence of the manager of that office. In October, 1913, he was sent to New York to assume the managership of that district, with headquarters in the Hudson Terminal building, 50 Church street. Mr. Stevens is a member of the Machinery Club of New York, the American Institute of Electrical Engineers and the Theta Delta Chi fraternity. T. D. Montgomery has been appointed to the position made vacant by the promotion of Mr. Stevens. Mr. Montgomery joined the Cutler-Hammer forces when the J. L. Schureman Co., Chicago, with which he was connected, was bought out eight years ago. He has been a member of the New York office sales engineering force for the past four years.

Plenty of Business

Without European War Orders—The Corporation's Tonnage

New York, Dec. 13. (By wire.)—In the discussion of any effects of an armistice on steel conditions emphasis is laid by leading authorities on the exaggerated idea in the popular mind as to the part munition steel purchases play in the present production going in any form to European battlefields and it is asserted that there is sufficient business backing up in the country to keep mills running full without war contracts.

The present position of the mills where many of them sold up to maximum capacity for all 1917 could not be stronger. The latest version of the Corporation's remarkable tonnage increase in November is that shell steel contracts included were much less than generally understood and did not exceed 10 per cent of aggregate bookings estimated at 2,500,000. The bulk of the tonnage came in rails, car and shipbuilding material and implement makers also closed some large lots. It is learned that the substitution clauses whereby other specified products such as plates and shapes may be shipped in place of shell steel in the event of peace are not included in some of the largest munition steel contracts. Producers in these cases declined to incorporate them because this might cripple the domestic market in these certain lines by draining the supply excessively.

Pittsburgh Not Alarmed

Pittsburgh, Dec. 13. (By wire.)—The proposal of Germany and her allies to enter into peace negotiations with the nations with which they are at war came as a surprise to the trade here. Officials of iron and steel companies who have followed the conflict in Europe are inclined to believe that suggestions understood to have been made by the central powers will not be accepted by the entente nations. The talk of peace, however, suggests the possibility that the end of the war is in sight. Manufacturers and consumers, it is apparent, will follow the stop-look-and-listen policy for the time being. Furthermore, it is not likely that prices of raw and finished materials will change much in position while peace negotiations are pending. The upward movement of the market temporarily has been arrested.

It is reported that a blast furnace interest has closed for from 6,000 to 8,000 tons of Connellsville coke per month for the first half of the year at $5, ovens, and some dealers are asking $5.25. Several days ago, a consumer bought 15,000 tons a month for delivery all of next year at $4, ovens. Spot furnace coke is selling from $7.75 to $8.25.

A recent purchaser of 10,000 tons of basic iron is understood to have shaded $30, but this may be due to the fact that he enjoys low freight rates from several blast furnace plants. An inquiry is out for 50,000 tons of basic iron for export.

Can Prices Withdrawn

New York, Dec. 12.—All packers' can prices have been withdrawn temporarily by the American Can Co. in view of extraordinary market conditions, which it is believed pertain largely to tin plate.

Scrap Strong in East

New York, Dec. 12.—Strong and active conditions prevail in old material but some of the highest prices obtainable are from the middle western, rather than from the eastern districts, and tonnage continues to be attracted to the former. This is equally true in heavy melting steel, for which the Pittsburgh market is $3 above eastern Pennsylvania.

The Non-Ferrous Metals

Copper Lead Spelter Tin

New York, Dec. 12.—The announcement by the German chancellor of peace proposals which Germany has transmitted to the entente powers, although not unexpected in view of previous intimations from Germany that the central European allies were ready for peace, aroused much discussion in the metal trade today with respect to the effect of peace on metal prices. It generally is expected that the conclusion of the war will be accompanied by a collapse in the prices of all the metals; as to what would happen to metal prices after the war no one would venture to predict. The prevailing belief is that the German peace move will not result in the conclusion of the war at this time, since the entente powers are not thought to be ready to listen to any terms. Today's development, therefore, is regarded as only a preliminary rift in the clouds.

Demand for copper has continued of fair proportions during the week closing today, and prices are somewhat higher. As previously reported, it is impossible at this time to secure any large quantities of electrolytic for first half delivery, all the nearby supplies being restricted to small tonnages in second hands. Electrolytic now is quoted as follows: December and January shipment 35.50c to 36c; February and March, 35c to 35.50c; second quarter, 34.50c to 35c; third quarter, 31.50c to 32c; fourth quarter, 30.50c to 31c, delivered, cash in 30 days. Ordinary lake copper is quoted as follows: December and January, 34.50c to 35c; February and March, 34c to 34.50c; second quarter, 33c to 34c, delivered, cash in 30 days. Casting copper also is exceedingly scarce for nearby shipment; December is quoted at about 33.50c to 34c, cash, January at 33.25c to 33.75c, and February at 33c to 33.50c.

A development of considerable interest during the week is the British order in council which prohibits further importations of copper and further dealings in copper, without a special permit. The only exception is in the case of contracts already made. The order also prohibits the use of copper for manufacturing purposes, except in the case of pending contracts, and directs that inventories of copper stocks be made and filed with the government on or before Dec. 16. This measure, it is believed, is intended as a measure of economy, and to increase the steadily diminishing copper stocks in Great Britain without increasing the already huge volume of imports of the metal. The action also is thought to be due to the fact that copper now is sold farther ahead than ever before, and efforts to secure any considerable additional tonnages of the metal for shipment during the first half of 1917, not only would meet with doubtful success but would result in putting up prices at which first half contracts could be renewed over the second half. The order, of course, does not apply to the use of copper in manufacturing war munitions.

The American Smelting & Refining Co. continues to quote 7.50c, New York, on lead, but the prices done in the outside market have gone far past this level. The outside market now is quoted at 7.87½c to 8c, New York, and 7.75c to 7.87½c, St. Louis. Independent producers, however, are not anxious to sell and it therefore is difficult to buy metal; second hands generally report they are unable to secure any lead.

Outside of several large inquiries for antimony, issued by concerns which are figuring on new shell contracts, the antimony market is quiet. Spot antimony is quoted at 14c to 14.50c, duty paid, while December and January shipment from China is held at about 13.50c, in bond.

The aluminum market is quiet but firm due to the scarcity of ingot metal. Some good sized tonnages of No. 1 virgin for prompt shipment have been booked for export at between 66c and 67c. The market on domestic business is about 64c to 66c for No. 1 virgin, prompt carloads; 59c to 61c for No. 1 remelted, and 44c to 46c, for No. 12 remelted.

The spelter market is weak, due to profit taking by speculative operators. There is practically no demand, however, and low offers are not bringing out many buyers. Prime western can be had at around 11.50c, St. Louis, for December, and 11.25c to 11.37½c for first quarter.

(For complete prices see page 1232.)

Identifying Light-Gray Inclusions

The Color of Inclusions Does Not Always Afford Positive Means of Distinguishing Sulphides and Oxides—An Etching Solution Has Been Discovered Which Promises to Eliminate Uncertainty

BY GEORGE F. COMSTOCK

IT SEEMS a common opinion among metallographists that all light-gray inclusions seen with the microscope in polished sections of steel are manganese sulphide. Examples of this belief are continually appearing and have been discussed in a number of papers. Slate-colored inclusions are considered to be silicates, and dove-gray inclusions, manganese sulphide. To show the danger in the latter unqualified assumption, it should be sufficient to examine the edge of any piece of steel that is covered with a fairly thick scale, and that has been polished in such a way as to prevent the scale from breaking away entirely below the polished surface. This can be done by protecting the scaled edge of the specimen with some soft metal, or fusible metal applied molten, or ordinary red fiber such as electricians use for insulating. An examination of this scale, if the polishing has been done well, and the sample is preferably unetched, will show it to be light gray in appearance, and apparently "manganese sulphide". As a matter of fact, however, we know that scale is chiefly iron oxide, and contains sulphur only as an impurity. Its similarity in appearance to manganese sulphide is shown in Fig. 1, which is a transverse view of the edge of a small hot-rolled steel rod, magnified 200 diameters. The steel has been etched with picric acid, but the gray scale can be plainly seen at the edge of the metal. The very dark material beyond the scale is the red fiber in which this specimen was clamped to prevent the scale from falling away during polishing.

Color of Inclusions is Confusing

In the course of several years' work with the microscope on rail steel and other commercial steels the writer has not infrequently seen light-gray inclusions that, from evidence given by sulphur prints, or for other reasons, did not seem likely to be sulphides, and in some cases these were known without any doubt to be oxides, like the scale mentioned above. Finally, a case of some importance

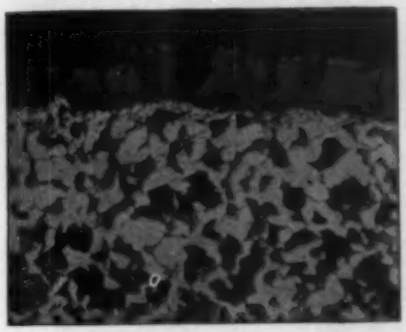


FIG. 1 — TRANSVERSE VIEW OF THE EDGE OF A HOT-ROLLED STEEL ROD ETCHED WITH PICRIC ACID

Magnified 200 Times

arose, where it was desired to know definitely whether certain light-gray inclusions were sulphides or not, and it was not possible to decide the question from their color alone. Reference to the standard textbooks on metallography did not help much, for the only real test described for distinguishing oxides from sulphides involved heating the polished sample in a current of carefully purified hydrogen, and this method was considered as too complicated and necessitating too much preparation and practice. Etching with weak organic acids was not found satisfactory, and neither was the method of using a drop of sulphuric acid and watching for bubbles of hydrogen sulphide gas. Tried with known sulphide inclusions, both these methods attacked the steel itself too strongly, or else, if the acids were weakened, had no effect either on steel or sulphides. It was finally decided to get together a few specimens containing sulphides, and others in which oxides were known to be present, and to try various solutions on them until one was found that would attack one type of inclusion and not the other.

This work had not progressed very far when it was remembered that boiling alkaline sodium picrate, which is used to darken cementite, having no effect on ferrite and very little on pearlite, was always found to attack the sulphide inclusions in a sample, leaving black pits instead of the light-gray spots seen before etching. Fig. 2, for instance, shows some sulphide inclusions in a polished section, unetched, cut from a segregated streak in a steel rail, where sulphur prints indicated the presence of high sulphur. This same spot, etched with boiling alkaline sodium picrate, is shown in Fig. 3, where the sulphides are seen to have been blackened by this reagent. The darkening seems to be due to an actual solution of the manganese sulphide in the etching liquid, so that instead of a smooth polished surface, we now have a surface full of pits or hollows, where the sulphides were, and as these hollows do not reflect any light back into the microscope with vertical illumination, they appear black in the field of view. Figs. 4 and 5 show some other sulphide inclusions in a shell-steel billet, before and after etching, respectively. In this lower-carbon steel the ferrite-pearlite structure is brought out faintly by the etching, but not enough to interfere with the distinct blackening of the sulphides.

Value of Discovery Proven

When this etching with boiling alkaline sodium picrate was tried on steel known to contain oxides, the problem of distinguishing oxides from sulphides was solved at once, for the oxide inclusions were found to be absolutely unattacked. Fig. 6 shows some oxides in a polished unetched sample of clean rail steel treated while molten in a crucible with nickel oxide. The steel undoubtedly reduced the nickel, forming iron oxide. Fig. 7 shows this same spot after etching, and looks exactly like the unetched view. Fig. 8 shows a cross-section, unetched, of a seam in the base of a steel rail. These surface seams are always filled with scale, or oxide, although the light-gray color has sometimes led observers to believe that manganese sulphide was present. The fact that such seams give light streaks instead of black spots on sulphur prints and etched sections, however, shows that oxide and not sulphide is really present in them. This seam, etched with boiling alkaline sodium picrate, is shown in Fig. 9. The oxide is seen to be entirely unattacked.

The application of this solution to etching all grades of steel for distinguishing between oxides and sulphides has not been described before, so far

The author of this paper, which is to be read at the February meeting of the American Institute of Mining Engineers, is metallographist, testing laboratory, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

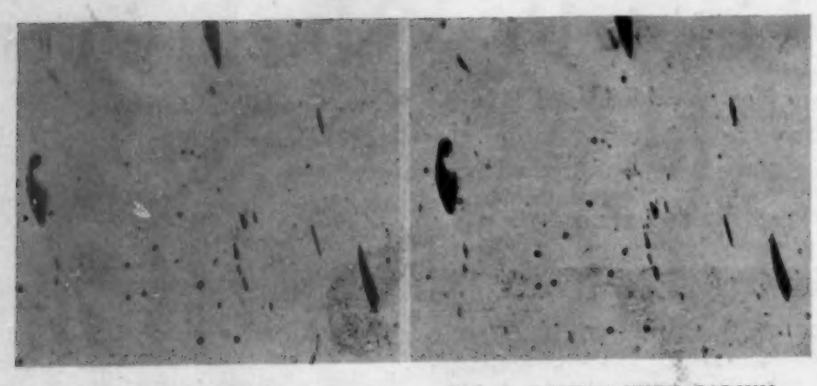


FIG. 2—UNETCHED FIG. 3—ETCHED WITH SODIUM PICRATE

Sulphide Inclusions in a Polished Section Cut From a Segregated Streak in a Steel Rod, Magnified 130 Times

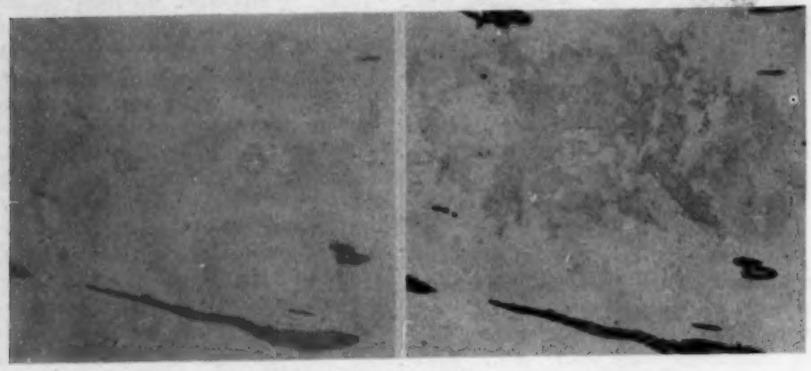


FIG. 4—UNETCHED FIG. 5—ETCHED

Sulphur Inclusions in a Shell-Steel Billet, Magnified 130 Times

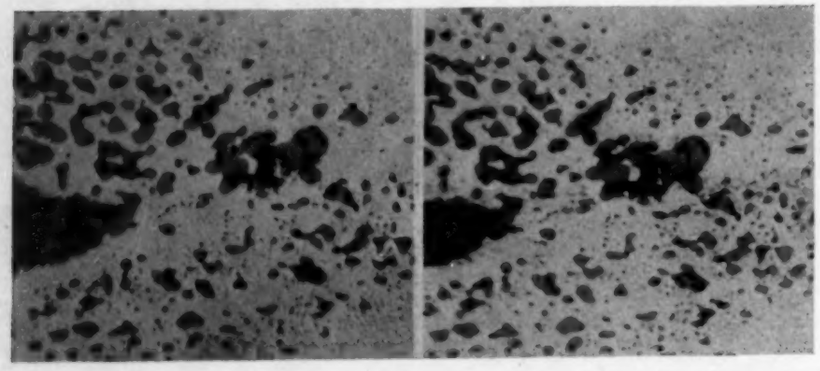


FIG. 6—UNETCHED FIG. 7—ETCHED

Iron Oxide in a Steel Rail, Magnified 130 Times

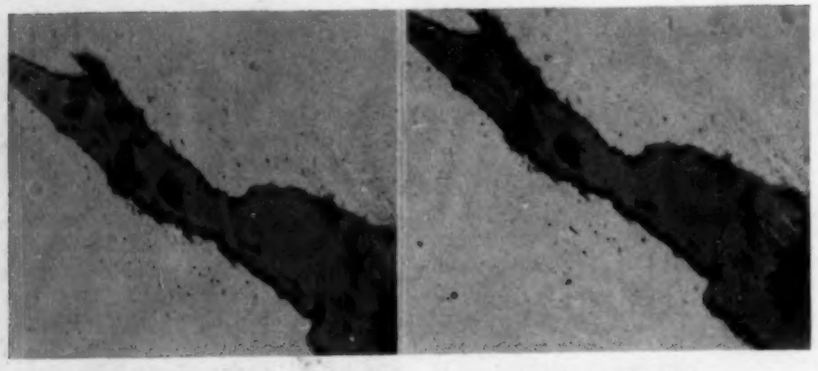


FIG. 8—UNETCHED FIG. 9—ETCHED

Cross-Section of a Seam in the Base of a Steel Rail, Magnified 130 Times

as the writer is aware. In case of application and certainty of results it is much superior to other methods that have been suggested for this purpose. One advantage is that the solution used is one that every metallographist should have on hand for etching cementite in high-carbon steel. Thus this same solution can be made to serve two purposes. It was first discovered by Kourbatoff, who recommended it for darkening cementite because it does not attack ferrite or pearlite. The writer makes up the solution according to the formula given in Sauveur's "Metallography and Heat Treatment of Iron and Steel", the procedure being about as follows: 25 grams NaOH are dissolved in 60 to 70 cubic centimeters of water, 2 grams of picric acid are added, and the solution is heated until the picric acid is dissolved, when the volume is brought up to 100 cubic centimeters by adding more water. In using this solution to etch polished steel specimens, it is brought to boiling in a beaker on a hot plate, the specimen is immersed in the solution and boiling is continued for 10 minutes. Then the specimen is removed, washed and dried. The polished and etched surface may be wiped dry with chamois skin without affecting the results. If the specimen contains cracks, this wiping is necessary, and repeated washing and drying may also be necessary to remove the last traces of the sodium picrate from the surface to be examined. The solution may be used many times, but as the boiling makes it more concentrated, water should be added occasionally to keep the volume about 100 cubic centimeters.

Fig. 10 shows a polished section of a steel casting which cracked while hot and in which the presence of oxides might therefore be expected. An experienced eye could perhaps tell which of these inclusions are sulphides and which are oxides, but the distinction at best would not be convincing. After etching by the method described above, however, the difference between the two kinds of inclusions becomes evident, as shown in Fig. 11. The arrangement of these sulphides is noteworthy, as a network is strongly suggested, and by this method of etching it can easily be shown that the small inclusions often found in a network arrangement in the ferrite of well-deoxidized steel castings are merely finely divided sulphides.

A large complex slag inclusion, also in a cracked steel casting, is shown unetched in Fig. 12. The light-colored rough-looking part of this inclusion

at the center of the field of view was bright yellow, and hence considered to be sulphide of iron. The other light-gray portions, including the spots in the dark-gray part, were supposed at first to be manganese sulphide, and the darker part, manganese silicate. But when etched with boiling alkaline sodium picrate, only the yellow constituent was attacked, showing that it alone was sulphide, and the light-gray constituent was oxide instead of manganese sulphide. The appearance after etching is shown in Fig. 13.

A section cut from a bar of "ingot iron" that was red-short and cracked in rolling is shown in Fig. 14, taken before etching. Most of the inclusions found here were light gray in color, but many of them had yellow parts attached to them at one or both ends. The yellow substance, which is very rarely seen in steel, was taken to be sulphide of iron, and the gray inclusions were at first supposed to be manganese sulphide. But the manganese content of this ingot iron was found to be very low, and the sulphur also was not high enough to allow the presence of so many sulphides. Consequently, it was doubtful whether these gray inclusions were sulphides or oxides, until the sample was etched with the boiling alkaline sodium picrate solution, when it was apparent at once that they were oxides, and only the yellow substance was sulphide. The inclusions of Fig. 14 are shown after etching in Fig. 15, where the distinction between oxide and sulphide is very plain. One of the largest particles of the yellow constituent was noticed, before etching, to have a spotted appearance, and when examined under high magnification it was seen to be full of very fine gray spots. This is evidently a eutectic of iron oxide and iron sulphide. It is shown in Fig. 16 magnified 570 diameters, the large unspotted dark-gray areas, with the black pits due to fracture in polishing, being oxide, and the spotted area being the eutectic. The oxide is here seen to be darker than the sulphide. Fig. 17 shows this same spot after a short etching with boiling alkaline sodium picrate, and it is apparent that the eutectic, but not the oxide, has been attacked, for the former is now darker than the latter, and its structure is blurred and indistinct.

These notes are presented in the hope that the simple method here described will appeal to metallographists in general as being worthy of trial in cases where the identity of light-gray inclusions in steel is in question, so that in the future they may be properly classified.

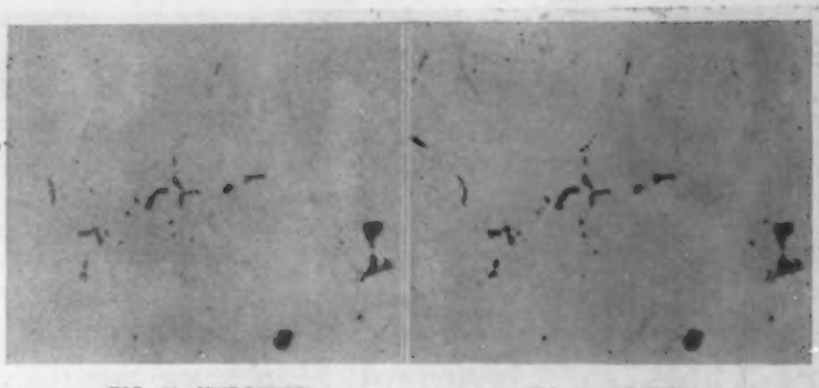


FIG. 10—UNETCHED FIG. 11—ETCHED
Polished Section of a Steel Casting Which Cracked While Hot, Magnified 130 Times

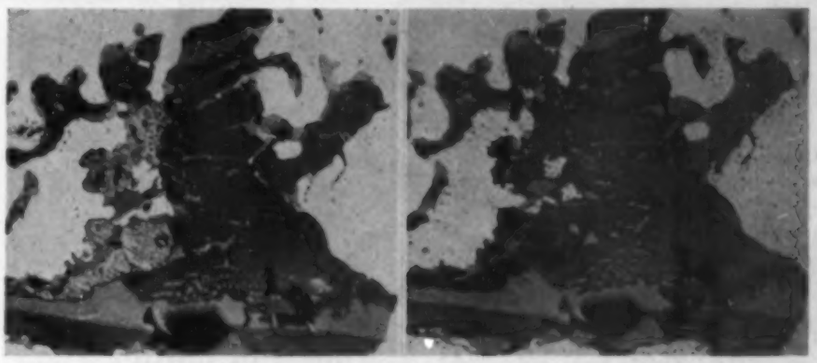


FIG. 12—UNETCHED FIG. 13—ETCHED
Cracked Steel Casting Showing Slag Inclusion, Magnified 130 Times

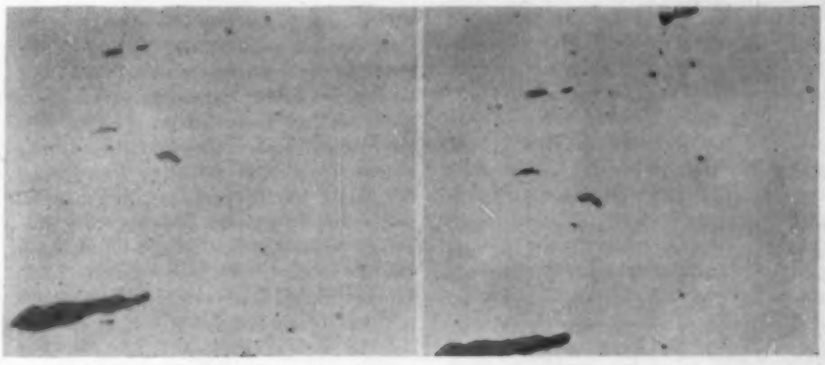


FIG. 14—UNETCHED FIG. 15—ETCHED
Section Cut From a Bar of Ingot Iron That Was Red-Short and Cracked in Rolling, Magnified 130 Times

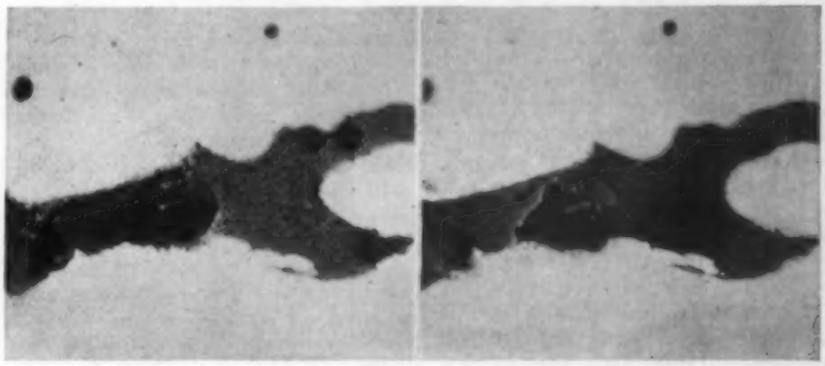


FIG. 16—UNETCHED FIG. 17—ETCHED
One of the Largest Inclusions in Fig. 14 Magnified 570 Times

WHAT'S WHAT and WHY

Don't Ask Yourself-Ask Us!

Questions from our Readers answered by Experts

Manganese Ore Prices

What are the current prices for first-grade foreign manganese ore?

The market for 50 per cent foreign manganese ore at this time is not very clearly defined for the reason that offerings are very scant and there have been no known sales recently. A fair statement of the market would be 65 to 70 cents per unit of manganese at tidewater. Buyers have offered 60 cents per unit, which sellers have declined to accept. Some sellers will not quote less than 70 cents per unit. In speaking of 50 per cent foreign ore, reference is made especially to Brazilian and Indian ore.

Foreign Iron Ore Sales

Why are there so few sales of foreign iron ore in this country at this time?

By foreign ore, we presume you mean principally transatlantic mineral. Several causes have operated to discourage offerings of such ore in this country. The main one seems to be the difficulty of getting vessel carriage at a rate which would permit the naming of a price acceptable to buyers in the United States. Vessels are very scarce and, furthermore, are able readily to obtain cargoes on higher grade freight which is much more profitable to the owners and more easily and more quickly handled than ore. Furthermore, to take ore cargoes, ships have to be diverted from the more profitable routes of trade. Again, since the allied nations need all the ore they can get, they are taking it up abroad whenever available and where they control the deposits, they are preserving these supplies for their own purposes. This is illustrated by the situation in African ore, which comes from French provinces. There have been a few recent sales of Spanish ore in this country, mainly of the low phosphorus quality, for which the furnaces are able to pay high prices in view of the extraordinary market on this grade of pig iron. Furthermore, the sellers have controled their own vessels. It is probable there will be some offerings of Cuban ores for next year after the market is defined by the settlement of the season's Lake Superior schedule.

Hardness of Cutting Tools

How does the hardness of cutting tools compare with the hardness of the materials that they are to cut?

Generally speaking, the hardness of steel cutting tools should be three times that of the materials worked on. Ordinarily, carbon steel cutting tools are hardened to from 99 to 110 on the scleroscope scale. Incidentally, it may be mentioned that a cutting tool having but twice the hardness of the material will dull very quickly. Metals to be machined with efficiency should be well under the scale of 50 in hardness. Tools for machining brass require the highest per cent of carbon.

Merchant Mills

What is a merchant mill and what products are rolled on mills of this type?

Broadly, the adjective "merchant" may be applied to mills whose product is offered for sale, but the merchant mill is generally understood in the iron trade as one which makes small sections. Tiemann says that mills for finished products may be divided into plate mills and shape mills for large sections and bar mills or merchant mills for small sections. One authority says the merchant mill is one producing a general line of merchant bars, including rounds, squares, flats and small shapes. These mills range in size from 20 inches down.

Duplex Process

The paper presented at the St. Louis meeting of the American Iron and Steel Institute, by G. B. Waterhouse, on the success of the duplex process has aroused my curiosity as to the production of steel by that process. Can you advise what the annual production has been and how many plants are engaged in making duplex steel?

The production and number of plants in the United States has been as follows:

Year.	No. of plants.	Production.
1912.....	7	1,438,654
1913.....	9	2,210,718
1914.....	5	835,690
1915.....	6	1,781,491

Prices of Machine Tools

What is the outlook for lower prices on machine tools?

Present indications are that the development of lower prices on machine tools is reserved for the indefinite future. With the exception of a recent decline in quotations on second-hand tools, the tendency of all machine tool prices continues to be in the upward direction. During the past 30 days, for instance, quotations on upright and high speed drilling machines have been advanced by 10 to 12½ per cent. The raw material cost and the cost of labor either continue to increase, or show no indication of declining, and most standard tools are sold up for months ahead, so that probably only a sudden cessation of the war in Europe would unsettle the machine tool market. With the preparedness program of the United States now beginning to be carried out, another machine tool buying movement of huge proportions has begun, and it is not unlikely that the effect of this demand by moving available deliveries still farther into the future will be reflected in still further advances in tool prices.

Standardization of Machine Tools

The Author Discusses Several Suggested Standards of Speed and Feed Series and Shows How the Progressions Used by Many Well Known Machine Makers Differ from the Ideal

BY CARL G. BARTH

DURING his many years of experience the writer has gradually been forced to see an enormous advantage in standardizing the machine equipment as a whole, aside from the standardization of the mathematical and certain constructive features of each machine. Wherever possible, his effort is to have only machines of the same make in a certain productive group, and in the expansion of such a group to add machines of exactly the same design, even to the extent of having a manufacturer furnish what is no longer his most recent product—only, however, if this or some other manufacturer's most recent product is not a sufficient improvement over the old to warrant the introduction of a new machine as a new standard for the work to be done, with the intention that this type will eventually crowd out and replace the older type.

Standard Speed Series

As in the present state of the science and the art of cutting metals, it is, on the average, impossible to determine the most economical or suitable speed and feed at which to run a machine for any set of conditions closer than a certain percentage, it is by this time universally accepted by those who have a right to an opinion in the matter, that the available speeds of a machine should be in a geometrical progression.

This being agreed to, the writer's idea is that a universal speed series should be adopted by all machine-tool builders for all machines such as lathes, boring mills, milling machines, drill presses, etc., that are provided with a spindle for either the work or the cutting tool, and which, except in the case of certain single-purpose machines not included in this discussion, may be rotated at different speeds; for our present knowledge does not warrant us in asserting or assuming that a progression of speeds for one kind of these machines should have a lesser or a greater constant ratio than for any other kind; and, evidently, if there is no reason for making them different, there is every reason for making them just alike. The question then becomes, what should be the constant ratio of such a universal geometrical progression of speeds?

As far back as 1888 the writer designed for William Sellers & Co., Inc., Philadelphia, a large lathe which had 30 speeds in a practically perfect geometrical progression, with a ratio of a little over 1.15, obtained by a correct relation between a 5-step cone, two back-gear reductions and two forward speeds of the countershaft. Again, in 1892, he designed another with 36 speeds which had a practically constant ratio of but little over 1.14, obtained by a 6-step cone, two back-gear reductions and two forward speeds of the countershaft.

These designs, only the latter of which was actually built, prove that this company was long ago able to appreciate the theoretical value of close speed regulation, though at that time the prevailing style of shop management, or, rather, lack of shop management, throughout the country was such that the knowledge was undoubtedly of no practical value to the generators even in the shops of this company. In fact, when the writer finally got some real ideas about such matters during his first two years of association and cooperation with Mr. Taylor at the works of the Bethlehem Steel Co., immediately after Mr. Taylor and Mr. White had made the discovery of the high heat treatment of tungsten steels, he realized that he had overreached himself in those two lathes. Therefore, in designing some special lathes for the Bethlehem Steel Co. for the better utilization of high-speed tools, he adopted 1.2 as a more rational ideal, and he has never since found any reason for deviating materially from this ratio; though it was several years later before he recognized the desirability of an absolutely constant ratio, not only for all lathes, but, as referred to above, for all machine tools with a revolving spindle.

Advantage of Simple Ratio

However, if we reconstruct a geometric progression with this simple ratio 1.2 and beginning with 1, all subsequent terms of this will naturally be found to be anything but simple numbers, thus: 1 1.2 1.44 1.728 2.074 2.488 2.986 3.583 4.300 5.160 6.192 7.430 8.916 10.70 12.84 15.41 18.49 22.19 26.62 31.95 38.34, etc.

In reality, therefore, we will have a simpler progression by slightly modi-

Presented at the annual meeting of the American Society of Mechanical Engineers, New York, Dec. 5 to 8, 1916.

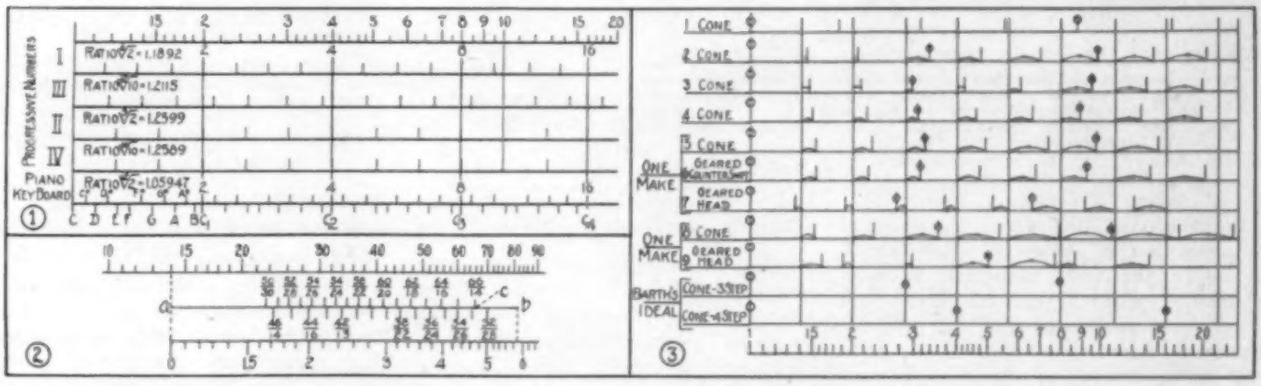


FIG. 1—LOGARITHMIC PLOT OF SUGGESTED ALTERNATIVE STANDARDS FOR SPEEDS AND FEEDS. FIG. 2—LOGARITHMIC METHOD OF APPROXIMATING A GIVEN RATIO WHEN TWO SETS OF GEARS ARE INVOLVED. FIG. 3—LOGARITHMIC PLOT OF SINGLE COUNTERSHAFT SPEED SERIES OF NINE 16-INCH LATHES

fying this ratio 1.2 such that the fifth term becomes 2 instead of $1.2^4 = 2.074$, for then the whole progression becomes

1 2$\frac{1}{4}$ 2$\frac{1}{2}$ 2$\frac{3}{4}$ 2 2.2$\frac{1}{2}$ 2.2$\frac{1}{2}$
1 1.1892 1.4142 1.6818 2 2.3784 2.8284
2.2$\frac{1}{2}$, 4 etc.,
3.3636 4.....I

or with every fourth term a power of 2, the simplest of all numbers except unity itself.

This is, to the writer, an exceedingly attractive progression and represents his ideal for some six years past. For lack of a better term, he has named a series of speeds conforming to the above geometrical progression a *chromatic* speed series, though the term chromatic in connection with a musical scale has reference to the geometrical progression involved, rather than to the ratio 2 of the number of vibrations of two notes an octave apart.

It may be, however, that the majority of machine tool builders will consider the ratio $\sqrt[4]{2} = 1.1892$ unnecessarily small, and would deem a somewhat larger ratio preferable, in order to obtain a larger final ratio between the slowest and the fastest speeds of a machine which, for one consideration or other, may have to be arranged with a rather limited total number of speeds, as, for instance, a lathe with a single back-gear reduction, or a small drill press or milling machine with no back-gear reduction at all.

The writer's answer is, that he has had in mind also as a possibly more generally acceptable progression, one with the contant ratio $\sqrt[3]{2} = 1.2599$; that is,

1 2$\frac{1}{4}$ 2$\frac{1}{2}$ 2 2.2$\frac{1}{2}$ 2.2$\frac{1}{2}$ 4
1 1.2599 1.5874 2 2.5198 3.1748 4
4.2$\frac{1}{2}$ 4.2$\frac{1}{2}$, etc., or
5.0397 6.3496 II

which is just as much entitled to the name chromatic as is progression I.

Again, as a compromise between progressions I and II and to favor a possible preference for a progression with 10 rather than 2 as a periodically recurring ratio, the following progression may also be looked upon as a candidate:

1 10$\frac{1}{12}$ 10$\frac{1}{6}$ 10$\frac{1}{4}$ 10$\frac{1}{3}$ 10$\frac{5}{12}$ 10$\frac{1}{2}$
1 1.2115 1.468 1.778 2.154 2.610 3.162
10$\frac{7}{12}$ 10$\frac{2}{3}$, etc., or
3.831 4.642 III

The constant ratio of this progression $\sqrt[12]{10} = 1.2115$ is very close to the geometrical mean of the ratios of progressions I and II, which is $\sqrt{2\frac{1}{2} \cdot 2\frac{1}{4}} = 2\frac{7}{12} = 1.224$.

And, finally, a certain interesting simplicity would also be introduced by the adoption of the constant ratio $\sqrt[10]{10} = 1.2589$, thus:

1 10$\frac{1}{10}$ 10$\frac{1}{5}$ 10$\frac{3}{10}$ 10$\frac{2}{5}$ 10$\frac{1}{2}$
1 1.2589 1.5848 1.9953 2.5119 3.1623

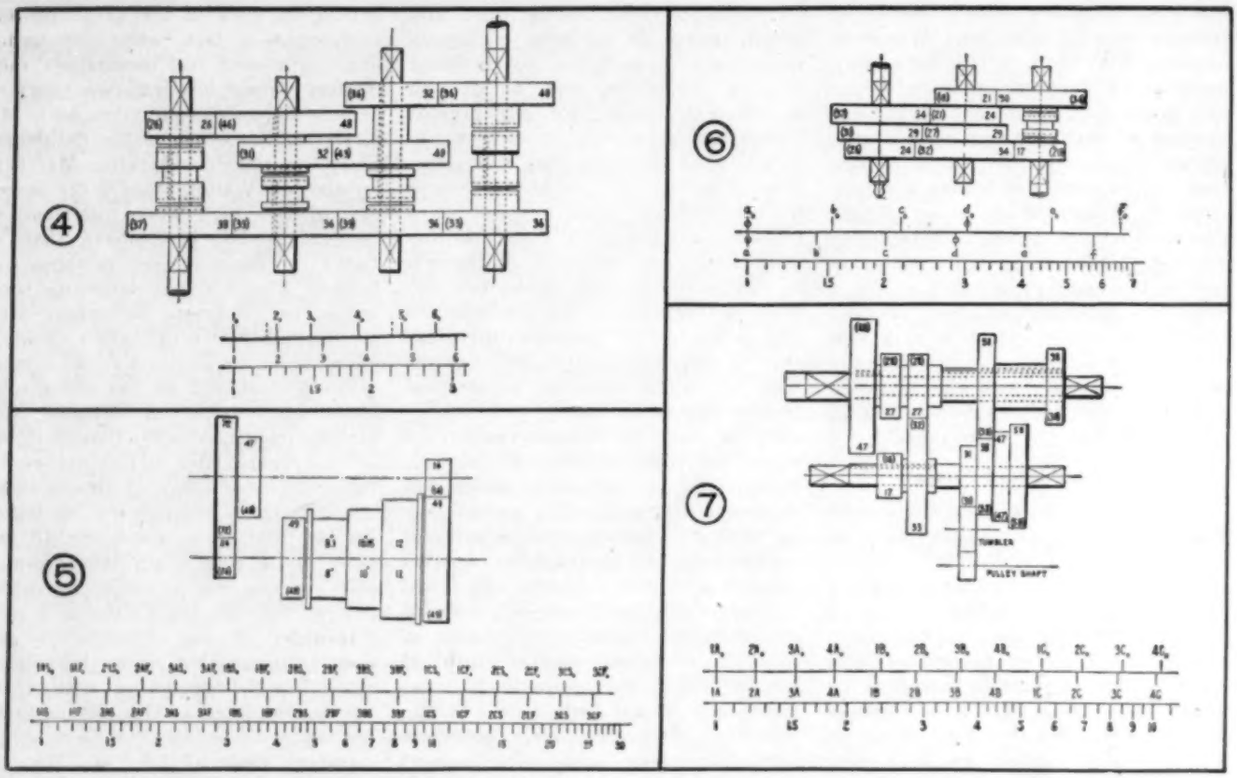


FIG. 4—DIAGRAM OF SPEED VARIATOR OF A WELL-KNOWN MAKE OF PLANER

(Figures in parentheses show number of teeth in gears as made; other figures show number of teeth to improve the speed series. 1_0 to 6_0 = logarithmic plot of original relative speeds; 1 to 6 = logarithmic plot of improved relative speeds.)

FIG. 5—DIAGRAM OF LIVE HEAD OF A WELL-KNOWN MAKE OF LATHE

(Figures in parentheses show respectively number of teeth in gears and diameters of cone pulleys as made; the other figures indicate a simple change that would further improve a very good speed series. 1 AS_0 to 3 CF_0 = logarithmic plot of original speeds; 1 AS to 3 CF = logarithmic plot of improved series.)

FIG. 6—DIAGRAM OF GEARS IN A FEED BOX OF A WELL-KNOWN MAKE OF DRILL PRESS

(Figures in brackets show number of teeth as made; other figures show improved number of teeth.
a_0 to f_0 = logarithmic plot of original relative feeds;
a to f = logarithmic plot of improved relative feeds; these conform quite closely to Progression V.)

FIG. 7—DIAGRAM OF DRIVING GEAR OF A WELL-KNOWN MAKE OF MILLING MACHINE

(Figures in brackets show number of teeth in gears as made; other figures indicate number of teeth in gears to further improve an already excellent speed series.)

$10\sqrt[5]{}$ $10\sqrt[6]{}$ $10\sqrt[7]{}$, etc.,
3.981 5.012 6.310 IV

It will be noticed, however, that there is in reality a theoretical difference only between progression II and this progression, the tenth number (7.943) of this being less than 0.8 of one per cent smaller than the tenth number (8) of the former.

Comparison of Series

But the best comparison of these four progressions is made by plotting them on a logarithmic scale, as in Fig. 1, on which is also plotted the progression that represents the relations between the number of vibrations of the strings of a piano, the constant ratio of which progression is $\sqrt[12]{2} = 1.05947$.

Of the four progressions described the author believes that series I is preferable. Under certain conditions every other term in this progression may be omitted, thus leaving

1 $\sqrt{2}$ 2 $2\sqrt{2}$ 4 $4\sqrt{2}$ 8 $8\sqrt{2}$
1 1.4142 2 2.8284 4 5.6568 8 11.3137
16, etc.,
16.....V

Progression I represents a fair average for the speed series provided by certain well-known machine-tool builders in some of the machines produced by them in recent years, after they had realized that the time had come for the provision of closer speed regulation, even if this meant a considerable reduction of the ratio of the fastest to the slowest speeds obtainable.

An example of this fact is represented in Fig. 3, which shows the speed ratio of nine 16-inch lathes offered by six different manufacturers in answer to an inquiry in February, 1914. One manufacturer offered three different designs and a second two different designs. It will be noted that the difference between the speed series provided in the different designs of the same maker, differ as much among themselves as do the designs of different makers, except in the case of lathe No. 1, which represents the least up-to-date design.

To make the diagram clearer, the speed ratios are laid out for a single forward countershaft speed only, thus showing only every other ratio of the full progression intended.

Selecting Number of Gear Teeth

Most designers of the present day, whether mathematically inclined or not, are familiar with the use of the simple slide rule in selecting practical numbers of the teeth for a gear and pinion of a single set of gears to give a certain ratio as closely as possible, but a simple logarithmic scale method for getting the closest possible approximation to a given ratio when two sets of gears are involved, which the writer has used for some years past, is not generally known.

This method will be fully disclosed by a single illustration embodied in the diagram Fig. 2, and we will take for our example the ratio $4\sqrt{2} = 5.6568$, with the restriction that neither pinion is to have less than 14 teeth, and that the sum of the numbers of the teeth in the one set of gears is to be 80, and in the other 60.

By means of a logarithmic scale which is shown just below the significant part of the diagram, lay off the ratio 5.6568 from *a* to *b*. Now place the graduation point for 14 on the logarithmic scale, representing a pinion of 14 teeth, at *a*, and make a mark at the graduation point representing the gear that would be a mate to this pinion, namely, one having $80 - 14 = 66$ teeth. This operation is indicated by the logarithmic scale above the significant part of the diagram. The distance *ac* then represents the ratio 66/14. Similarly, 15 is placed at *a* and a mark made at 65, 16 is placed at *a* and a mark made at 64, and so on, as far as will eventually appear necessary. Next, below the line place the graduation point 14 at *b*, and mark off toward *a* the point for the mate for this pinion in the second set of gears, namely, $60 - 14 = 46$, repeat

(*Continued on page* 1210.)

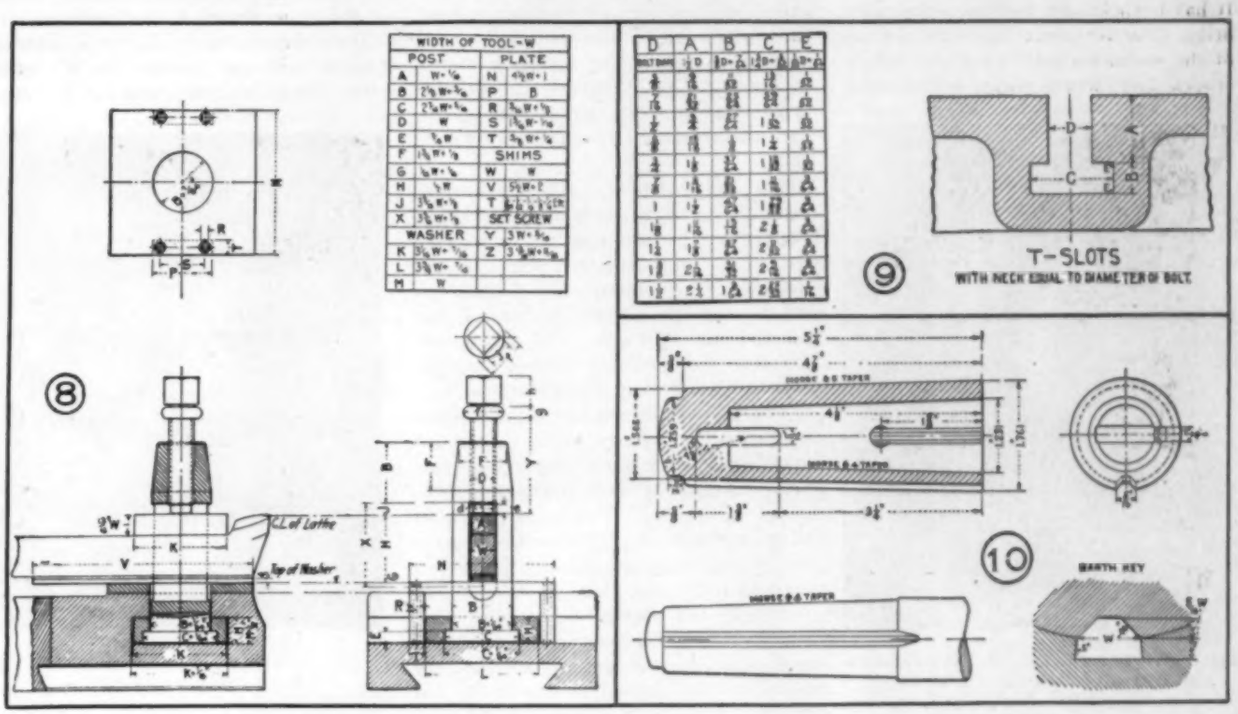


FIG. 8—PROPORTIONS FOR SWIVEL FORM OF TOOL POST FOR MODERATE-SIZED LATHES

FIG. 9—PROPORTIONS FOR T-SLOTS. FIG. 10—KEY METHOD OF DRIVING DRILL, ARBOR AND BORING BAR SHANKS

The Hardening of Gun Surfaces

The Severe Service to Which Gun Steels Are Exposed Causes a Rapid Erosion Which Scientists Have Tried for Years to Eliminate—A Discussion of Hardening Effects Are Presented in This Article

BY HENRY FAY

THE erosion of guns is a complex problem which can be solved only by a detailed study of all the factors involved. The particular phase of the problem which will be presented here is the hardening of the inner surface of the gun tube. It has been known for years that after firing guns for some time, the surface of the metal becomes hard and brittle, cracks and wears away. The character of this phenomenon may be learned by an examination of some results which are typical, obtained from a detailed study of a 12-inch gun. The gun was trepanned and rings representing various sections of the gun were cut out for examination. The first ring represented the metal at the muzzle end, and the other rings were removed at approximately 120, 240, 325 and 337 inches, respectively, toward the breech end. The appearance of the surface of the metal in the different sections is shown in Fig. 1. The greatest amount of wear and maximum amount of hard surface layer was found in section marked *E*, which is nearest the powder chamber and at the beginning of the rifling; the maximum amount of cracking in *D*; the maximum amount of copper deposition in *C*. Section *B* showed heat cracks on both land and grooves, and section *A* showed heat cracks on the driving edge of the lands only. There was much flow of metal in both sections *E* and *D*, and there was progressively less effect noticeable toward the muzzle end. The polished cross-section of these same pieces is shown in Fig. 2. The extent of the errosion is greatest nearest the powder chamber, and diminishes toward the muzzle end.

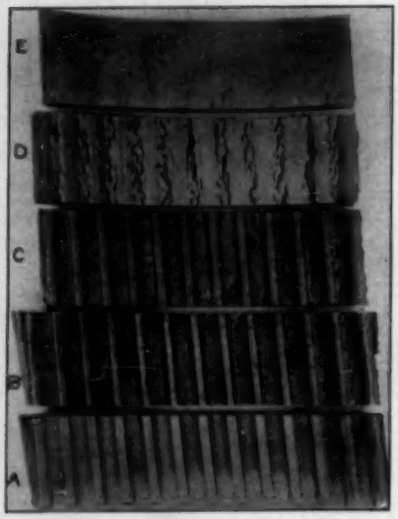


FIG. 1—APPEARANCE OF METAL SURFACE TAKEN FROM DIFFERENT SECTIONS OF A 12-INCH GUN

The depth of heat crack varies irregularly in each section, and somewhat regularly in sections proceeding from *A* to *E*, increasing in depth toward the powder chamber. The number of cracks does not, however, vary in the same way. In section *E*, where the greatest erosion has taken place, the smallest number of cracks appear.

The greatest depth of crack is found in section *D*, with an average depth of 0.038-inch. The width of crack in this section varies between 0.001 and 0.015-inch. In section *E* the depth varies between 0.024 and 0.039-inch. In section *C* the average depth of crack is only a trifle less than in *D*, but the width is not nearly so great. The cracks diminish progressively in depth and width in sections *B* and *A*, the latter section showing practically no cracks on the face normal to the axis of the gun. On a face parallel to the axis of the gun and cut along the driving edge, section *A* shows some clean, sharp cracks about 0.01 in depth.

Physical Characteristics of Test Sections

Sections *B*, *C*, *D* and *E* show a hard layer of metal on the face cut normal to the axis. All five sections show the hard layer on the face cut parallel to and along the driving edge. The depth of the layer of hard metal on the face normal to the axis varies as follows: *A*, 0.0000-inch; *B*, 0.0004-inch; *C*, 0.00008-inch; *D*, 0.0013-inch; *E*, 0.0015-inch.

The cracks are undoubtedly due to the unequal expansion and contraction between the hard and soft layers. When subjected to strain the hard, brittle surface develops cracks, and the cracks penetrate into the soft metal. The section showing the greatest thickness of hard layer ought to show the greatest depth of crack, but other influences counteract this effect.

The microscopic appearance of a surface showing cracks is shown in Fig. 3, and in Fig. 4, the latter a characteristic structure always found at the junction of a land and groove. The interpretation of these photographs will be considered in detail after discussing the cause of the formation of the hard layer. In addition to the hardening which takes place in the gun tube proper, hardening and cracking of the surface takes place on the pressure plugs which are inserted in the guns for the purpose of measuring maximum powder pressures. The pressure plug shows hardness around the edge of the central hole, around the edge of the plug itself, and shows the effect of hardening in the form of cracks all over the surface, but particularly in the vicinity of letters which have been stamped on the surface. Any theory which may be offered to explain the hardening of the gun tube proper must also explain the hardening and cracking of the pressure plug.

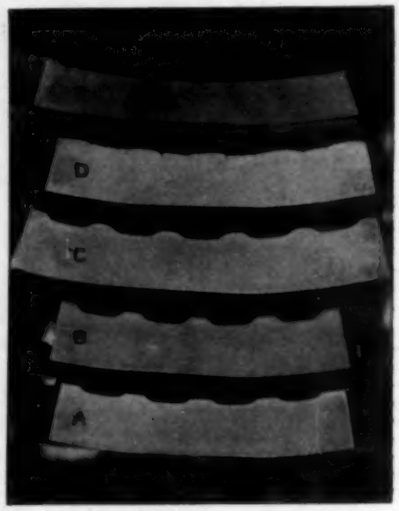


FIG. 2—POLISHED CROSS-SECTIONS OF PIECES SHOWN IN FIG. 1

While these results are in general typical of what takes place, there are variations in individual cases. For instance, the metal on the driving edge may not have been affected as it was in the 12-inch gun referred to, but

A paper which will be read at the February meeting of the American Institute of Mining Engineers. The author is professor of analytical chemistry, Massachusetts Institute of Technology.

it is merely a matter of time until the conditions as described are obtained. The action is a progressive one and is dependent upon the number of times the gun is fired.

The Cause of Hardening

Hardening may be produced by three well-defined methods: (1) cementation; (2) heat treatment; (3) mechanical deformation or cold work.

Cementation. — The principal products of combustion of the powder are carbon dioxide, carbon monoxide, water and nitrogen. The equilibrium phenomena are very complex and will vary with the composition of the powder, the temperature and pressure. It is conceivable, however, that large amounts of carbon monoxide may be formed and under the conditions of high temperature and pressure cementation could take place. Giolitti has shown carbon monoxide to be an ideal

FIG. 3—BRIGHT APPEARANCE OF SURFACE AFTER ETCHING SUGGESTS PRESENCE OF CEMENTITE

carburizing compound, and on repeated firings small increases of carbon to the surface might take place. This would produce a hard, brittle layer on the surface richer in carbon than the original metal.

Heat Treatment.—When a piece of steel is heated above its critical temperature, Ac_1, and then suddenly quenched, it is hardened, the depth of hardening being dependent upon the temperature of heating and the rate of cooling. The temperature of combustion of the powder is sufficiently high to heat a skin of the metal above the Ac_1 point, and hardness would result if the surface were cooled with sufficient rapidity. The relatively low temperature of the large mass of steel would produce a rapid loss of heat.

Mechanical Deformation or Cold Work.—It is a well-known fact that when any ductile metal is subjected to mechanical deformation it becomes hard and brittle, and if the work is carried too far, cracking will result. Even the most ductile metals, such as gold and platinum, lose their plas-

FIG. 4 — THIS EXAMPLE ALSO SUGGESTS THE PRESENCE OF CEMENTITE. ETCHING WAS DONE WITH SODIUM PICRATE

ticity and become hard and brittle when subjected to drawing, hammering, etc. In wire drawing it becomes necessary to anneal the metal frequently in order to restore plasticity and prevent it from cracking. This phenomenon is common to both ductile and brittle metals.

The mechanism of this action has been studied in detail by Beilby and his conclusions have been confirmed and accepted by many other investigators. According to him, a surface skin may be built up by mechanical movement which gives unmistakable evidence that the surface must have passed through a state in which it possessed the perfect mobility of a liquid. This surface possesses distinctive properties which differentiate

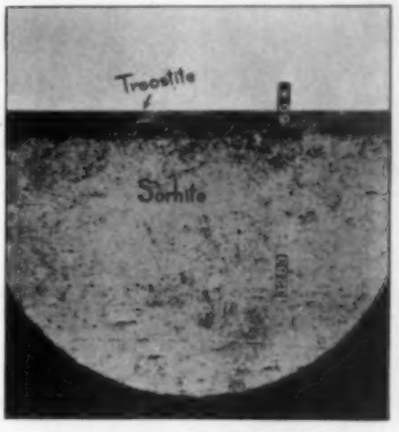


FIG. 5—THIS SPECIMEN SHOWS TROOSTITE DEVELOPMENT—33 DIAMETERS

it from the surface beneath it. Hardening thus results from the formation at all the internal surfaces of slip or shear of mobile layers similar to those produced on the surface by mechanical movement. These layers retain their mobility for a brief period only, and then solidify in a vitreous amorphous state cementing together all of the surfaces of slip or shear throughout the mass.

Such a surface produced by polishing, burnishing, drawing, hammering, or cold work of any kind, possesses the property of hardness and brittleness. Metal in this condition may be restored to its natural crystalline ductile state by annealing.

Having considered the manner in which hardness may be produced, it becomes necessary to examine the different methods in detail, and to see by which method the facts can best be explained. It would seem at first sight to be rather difficult to prove whether or not cementation had taken place, as the maximum thickness of layer which had been hardened

FIG. 6 — SELECTIVE CONVERSION OF SOFT TO HARD METAL—50 DIAMETERS

amounted to only 0.0015-inch. It was obviously impossible to cut off this layer for analysis, not only on account of the thinness, but also on account of the hardness.

Does Cementation Occur?

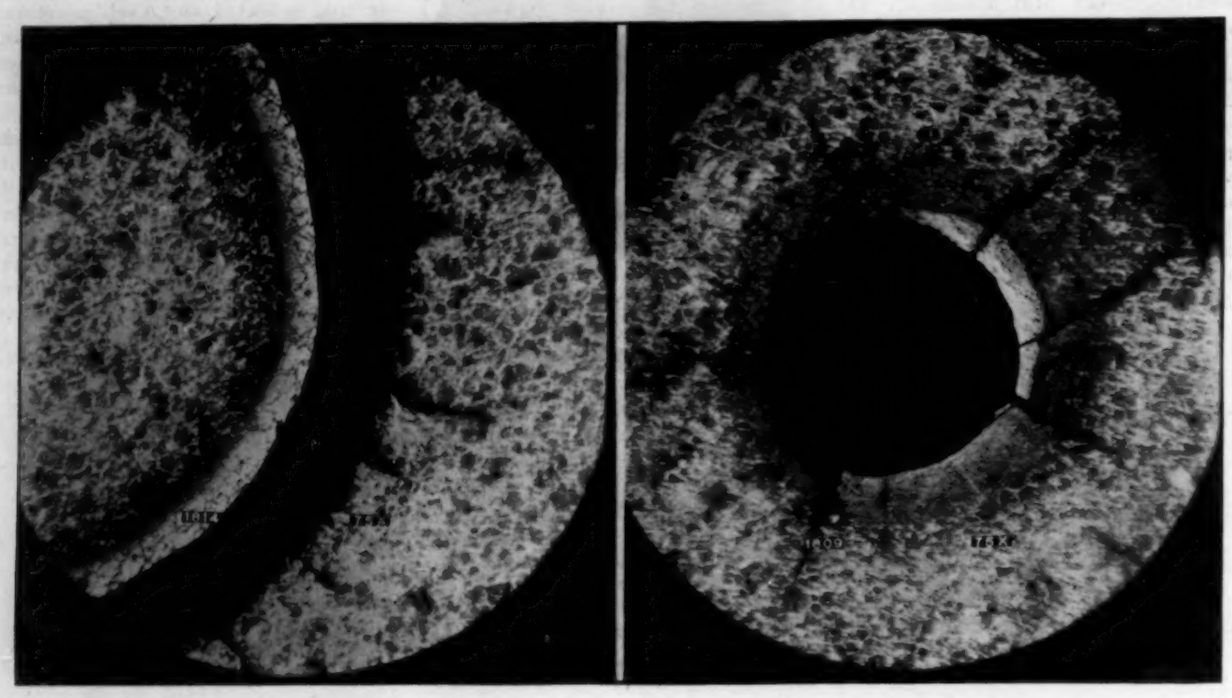
Microscopically the appearance of this surface suggested cementite, as it remained bright after etching, as shown in Figs. 3 and 4, and, furthermore, in no case was there any evidence, even under high power, of martensite, which would also remain brighter than the original structure. Etching with boiling sodium picrate, which darkens cementite, gave negative results. The hardness of the layer and its appearance would indicate free cementite, but this test would, therefore, appear to be conclusive that the surface cannot contain any free or excess cementite. The test was carried out always with a control piece which contained about 1.25 per cent

of carbon, and therefore known to contain free cementite. Under all conditions the control gave positive results. There is some doubt as to whether or not a small amount of cementation takes place, and experiments are in progress which, it is hoped, will prove this point defintely.

While it seems fairly clear that the hard surface layer is not free cementite, judging from the sodium picrate test as evidence, it would have been difficult on this basis to explain the fact that the hard layer occurs only on the driving edges in the muzzle end of the gun. Selective formation would not seem probable. That hardness might be produced by raising the temperature above Ac_1 and suddenly cooling seems entirely possible, and most of the facts can be explained on this basis. The temperature within the gun at the time of the explosion is far above Ac_1 in fact may be above the melting point of the metal. A thin skin of metal is heated for a brief period during the explosion, and before the heat can penetrate any distance, it is cooled by the mass of metal back of this layer. Such a hardening ought to produce the microscopic constituent martensite, but this structure in its characteristic needle-like form is never found, although troostite is frequently found. Rosenhain and Belaiew have reported martensite in the hardened surface of the rifling of a gun, but so far in the examination of many gun fragments, and in trepanned guns, the characteristic martensitic structure has been missing. In some experimental steels which had been subjected to erosion tests by allowing the gas of an ignited charge of powder to escape through a tube of the metal, there was found not only well-characterized martensite but also troostite adjacent to it. The essential difference in this case is that there was no projectile to produce mechanical deformation on the surface.

That the hard surface is actually composed of martensitic material is proved by the fact that on tempering it passes over to characteristic troostite. Samples were cut out of the ring from section *E*, and heated for 15 minutes to 300 degrees Cent, 400 degrees Cent., 500 degrees Cent., 600 degrees Cent. and 700 degrees Cent. The specimen heated to 300 degrees Cent. showed troostite development most markedly and unmistakably, as shown in Fig. 5. The 400 degrees Cent. and 500 degrees Cent. samples also showed troostite, but less well defined, the transformation having progressed further, and there was almost complete revision in the specimens heated to 600 degrees Cent. and 700 degrees Cent. This experiment seemed to prove conclusively that the hard surface was martensite, but threw no light upon the fact that in the muzzle end of the gun the surface was hardened on the driving edge only.

It was thought for a time that mechanical deformation or cold work produced by the rotating projectile



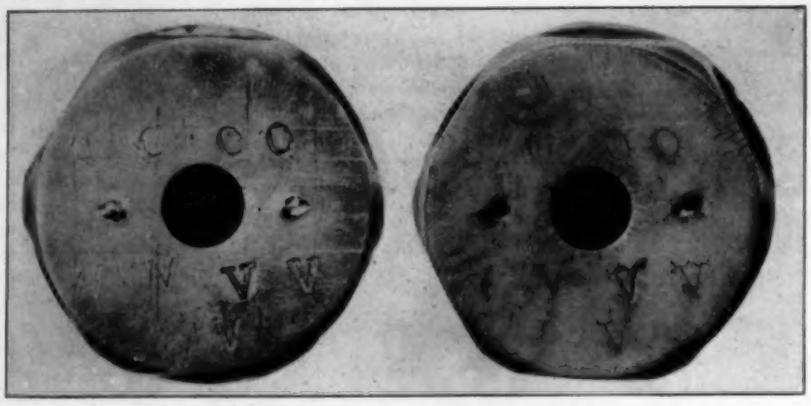


FIG. 7—ANOTHER ILLUSTRATION OF SELECTIVE CONVERSION. THE LIGHT AREA IS THE HARD AREA. FIG. 8—FIGS. 6, 7 AND 8 INDICATE THAT THE MAXIMUM AMOUNT OF COLD WORK WAS APPLIED WHEN STAMPING. FIG. 9—PRESSURE PLUG BEFORE HAVING BEEN PLACED IN SERVICE AND SAME PLUG AFTER HAVING BEEN IN A GUN WHICH WAS FIRED 100 TIMES. FIGS. 7 AND 8—52 DIAMETERS

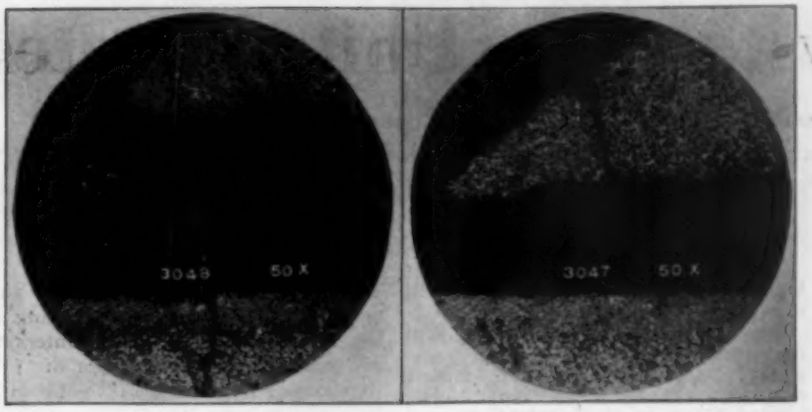


FIG. 10—LETTER V IMPRESSED AT 5,000 POUNDS. FIG. 11—LETTER V IMPRESSED AT 2,000 POUNDS—40 DIAMETERS

would account for all of the phenomena, but this idea was negative by the martensite-troostite conversion; by the fact that the powder chamber itself, untouched by the rotating projectile, showed hardness, and by the fact that the pressure plug showed hardness.

That mechanical deformation has much to do with the production of hardness is shown by the selective hardening on the driving edge of the land on the muzzle section, and by some experiments which were conducted on pressure plugs.

Experiments With Pressure Plugs

Knowing that pressure plugs harden in the same way as the surface of the gun tube itself, it was decided to experiment with pressure plugs, and to follow the development of the hard surface layer in its various phases. For this purpose, a plug having approximately the same composition as gun steel was prepared for service. The metal was carefully analyzed, it was heat treated, and photographs were made of the fine sorbitic structure. The surface as a whole was uniform. The prescribed lettering was stamped on the surface. It was then placed in service, and after having been fired until it showed signs of heat cracking, was returned for miscroscopical examination. The face was polished and etched, and the structure seemed to be normal, but it was seen on detailed examination that the hard surface had begun to appear on the edge of the center hole and on some of the letters. Examination showed that this development had taken place at those points where the ***maximum amount of cold work had been applied in stamping the letters.*** This is shown in Figs. 6, 7 and 8, representing the letters *A*, *O* and a period respectively. In the letter *A* and in the period the die was apparently not held in a truly vertical position and one side of the letter was cold-worked more than the other. Selective conversion of soft to hard metal has taken place at these points. This

FIG. 12—LETTER V, SAME AS SHOWN IN FIG. 10 BUT AFTER FIRING 200 ROUNDS

is shown in the lighter area of Fig. 6, and also of Figs. 7 and 8, the light area in each case being the hard area. Observations of a similar character were made on almost every letter on the face of the pressure plug, each showing partial conversion from soft to hard structure at the point of maximum cold work.

This evidence seemed to favor the view that cold work was an important factor in the martensitization of the metal. In order to test this view systematically, a second pressure plug was prepared and the letters *V* and *O* were stamped on the face of the plug at varying pressures. This was done by holding the stamping die in one jaw of a tensile testing machine and the plug in the other jaw. The machine was then put into compression and the letters stamped at varying pressures, from 500 to 2,000 pounds, as shown in Fig. 9. By mistake, one of the letters *V* was stamped at 5,000 pounds instead of 2,000 as originally intended.

Results of Test

The pressure plug was then put in service and the gun was fired 100 rounds, when the plug was returned for examination. The original sorbitic condition of the metal was found to have changed to the troostitic condition at those points of maximum cold work and to have remained practically unchanged at other points. Thus the first step in the change sorbite—troostite—martensite has been accomplished. Figs. 10, 11, 13 and 14 show the letter *V* at 5,000, 2,000, 1,500 and 1,000 pounds respectively. In Fig. 10, the troostitic character of the metal is clearly shown on the edge and apex of the letter *V*. The letter impressed at 2,000 pounds also shows the change, but not advanced so far as in the letter of greater pressure. At 1,500 pounds the change has begun but the advance has not been far, and at 1,000 pounds pressure the change is not noticeable.

In the same plug similar changes were noticed on the edge of the cen-

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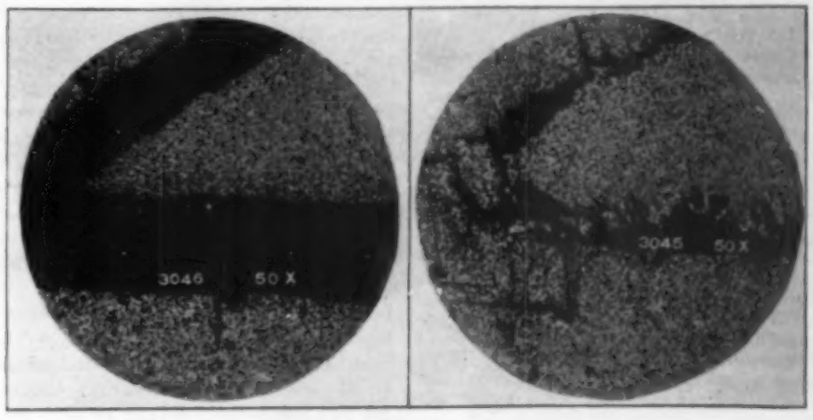


FIG. 13—LETTER V IMPRESSED AT 1,500 POUNDS. FIG. 14—LETTER V IMPRESSED AT 1,000 POUNDS—40 DIAMETERS

Warrant System in United States

Its History and Possibilities Described—Great Losses Suffered During Periods of Extraordinary Advances—British Iron Masters Puzzled by Attitude of Americans

BY GEORGE H. HULL

EXTRAORDINARY activity in the buying and selling of pig iron warrants in this country during the past 18 months has made pertinent the query whether American producers and consumers are awakening to the advantages of the warrant system and whether trading in this form will become an increasingly important branch of the iron market of the future.

This is a difficult question to answer. Some time before the active buying in warrants commenced, we had printed and sent broadcast a small slip which reads as follows:

Pig iron is an ideal staple to loan upon. It is not injured by age, exposure or fire. It is stored in open yards in full view of the public. It cannot be spirited away without detection. It requires no insurance. Its constant demand is so sure, and the cost of carrying so small, that it stands pre-eminent as an article for investment. For instance, accumulative stocks have been exhausted 10 times in the last 83 years, at from 80 to 300 per cent advance in price, and if one were to invest today $5,000 in each of the three great staples, the relative cost of monthly storage carriage would be as follows: Corn, $65; cotton, $60.17; pig iron, $6.57.

About the same time there appeared on Wall street a seven-page article published by some persons unknown to the writer, which contained some very startling presentations. We quote some clauses from the article as follows:

The present world shortage of pig iron and its products is upwards of 70,000,000 tons.

The annihilation of iron and steel through war alone is at the rate of 10,000,000 tons annually.

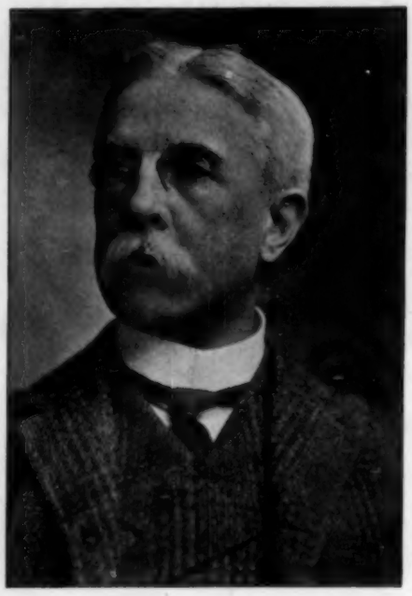
Every pound of metal that either Germany or England can produce will be required within its own territory for the supply of its transportation systems and its industrial arts. Germany, for three years after the war has terminated, will find its productive capacity inadequate to meet the demands of the people of that country and of Austria, its neighbor.

Russia, Italy, France, the Mediterranean states, Japan, India the East Indies, Australia and South America, whose markets were largely if not altogether supplied by Germany and England, must turn to the United States for their supply.

The longer the war continues the higher the price of iron products will eventually go.

England, Germany and Austria will necessarily in the two years immediately succeeding the war, import more steel than they export. The United States must, therefore, prepare to supply the demands of the world whose stocks of iron and steel are depleted.

This circular was sent broadcast. It is possible that these circulars had some effect in stimulating the speculative buying of pig iron, or perhaps it is true, as has been suggested, "that American pig iron producers are awakening to the value of the warrant system and extended trading by this method in the future will become more permanent and will continue to increase". If the iron producers of the United States have finally awakened to the ills they have suffered in consequence of their failure to adopt the pig iron warrant system, they are to be congratulated, and *The Iron Trade Review* can do its furnace friends no greater service than to tell them the truth. The British iron masters cannot understand why the American producers did not seize the warrant system with avidity, but it is not strange, for there is no very good thing proposed that does not meet with opposition, and, as a rule, the better the new thing is, the more opposition it encounters at the start. Take the question of "preparedness", for instance. Up to within a few months the President of the United States and a host of other important men opposed any movement in this direction. Then suddenly they awoke to it, and its acceptance came with a rush. To oppose the adoption of the warrant system is just as unwise as it was to oppose the adoption of the preparedness movement. They are not only similar, but one is part of the other. In the first instance, the pig iron producers of this country not only throw away millions of dollars every year they postpone the full adoption of the warrant system, but for the same length of time they postpone America's opportunity to seize a share of the world's big international business. In the second instance, the United States imperils its very existence as a nation every year it delays its acceptance of the pre-preparedness system.



GEORGE H. HULL

In order that the reader may not think my estimate of what the iron producers throw away is an exaggeration, let me cite a single instance of what I mean: In August, 1903, bessemer pig iron at Pittsburgh was $18.35 per ton. Twenty-eight months later, or December, 1905, it was at the same price, but, in the meantime, it had declined $5.85 per ton. During the same period in England and Scotland, where the warrant system was in universal use, pig iron declined an average of only 97 cents per ton. The consumptive demand in Great Britain was as dull as it was in America, and there was nothing to sustain the British prices except the warrant system, with its daily sales on exchange in London and Glasgow. In fact, the papers both in Great Britain and in the United States contained frequent articles in relation to the great decline in prices in the United States and to the small decline in Great Britain, and all these papers agreed that it was on account of the sustaining influence of the British warrant system.

Officially quoted prices available for any one interested, will confirm my estimate of the great wealth which the

George H. Hull, the author of this article, is president of the American Pig Iron Storage Warrant Co., New York City.

American producers threw away, in consequence of their failure to comprehend and embrace this splendid system.

Suffer from Declines

The American iron producers not only suffer from these disastrous and unnatural declines as they occur, but they suffer even greater losses during periods of extraordinary advances in prices. Take as an illustration the period of 24 months between December 1897, and December, 1899. During the first part of this period, the American furnacemen contracted, in advance, for all the iron they could produce in the subsequent six to 12 months, at prices which ranged from $6 to $8 per ton for No. 2 foundry in Alabama and from $9 to $12 for bessemer and No. 2 foundry in the northern states. Then came the big advance of 1899, during which these irons advanced to $19 and $25, respectively. Some furnaces spent the entire year of 1899 producing and delivering iron contracted at the low prices of 1898. Others caught up on their low-priced contracts sooner, but the American iron producers as a whole might have saved many millions of dollars in 1899 if they had all adopted the warrant system 10 years before, and through it been able to sell their product from month to month as made. This was not an exceptional case. It has taken place every time business has experienced a boom in this country. For instance, during most of the boom months of 1902 the furnaces were making and delivering iron on their low-priced contracts made in 1901, and in the boom of 1906, they spent a large part of the time delivering on their low-priced contracts current three to 12 months before. To get some conception of the many millions of dollars of profit missed by them during this period of seven years from 1899 to 1906, one has only to remember that these three boom advances were respectively 147, 165 and 173 per cent above the "zero" price of July, 1897. There are no records extant of how much each individual furnace lost during these three periods of abnormal advances in consequence of not being able to realize the enormous monthly advances as they occurred, but I have no doubt the total loss for the American furnaces was more than a hundred millions of dollars during these seven years. Some objectors may reply to this with the claim that a compensating gain is made when prices go down and makers are able to deliver on old contracts at higher than existing market prices, but this is not true, for the long contracts they are able to make at times of abnormally high prices are but a small fraction of what they make at times abnormally low prices exist.

The British iron masters cannot understand why the American producers throw away all these splendid opportunities. Scotchmen have a brutal kind of way of telling you the truth sometimes. One of them on the floor of the Royal Exchange in Glasgow one day said to the writer: "As a whole, I regard the business men of America as wide awake and enterprising, but I always except the iron producers." These he designated in terms too humiliating to repeat. As an evidence of his assertion he said: "Look at every iron district in your country; they look like grave yards, dotted all over with abandoned furnaces, monuments of lost fortunes. Your iron producers not only throw away their wonderful opportunities of great profits, but they hug to their breasts their great opportunities for loss."

British Foresight

In Great Britain, when a builder closes a contract to construct anything which requires a large amount of iron and steel deliverable over many months in the future, he protects himself against loss through possible advances in the prices of iron and steel by making a contract with a warrant dealer for an equal amount of iron warrants deliverable over a like period. The warrant dealers have a schedule of prices for this protection which they sell at rates which many years of experience have demonstrated, like rates for life and fire insurance, to be both safe and profitable. They will sell protection for several years ahead, as readily as they will for a few months ahead. When the progress of his contract work requires the builder to buy iron and steel, he does it at the then market price and sells a like tonnage of warrants on exchange. If iron and steel have gone up, warrants have gone up about the same. In this way he is protected against advances during the life of his long building contracts. This manner of protection costs the contractor something, but that is no disadvantage, for all bidders must include this expense in their estimates, just as they do all other regular expenses. If the warrant dealer, when he made a protection contract, were to buy, at once, the full amount he had contracted to the builder, and carry it through the life of his contract, the expense of storage and interest would eat up his profits. Furthermore, it would be impossible to do it, as the British furnaces never produce enough to supply such a demand over and above the amount taken for consumption. He usually buys at the start about 25 per cent of the amount he has contracted, and adds to it as he can

Interesting Career of George H. Hull

George H. Hull, known in the iron trade as the leading authority in this country on pig iron warrants, has attained this distinction by the devotion of many years to a close study of the problems of the merchandising of pig iron. Practically all his business career has been identified with the iron trade. His first connection with this business was in Cincinnati in 1857. His brother at that time was with the house of Stedman, Carlisle & Shaw, chief owners of a furnace in the Hanging Rock region in Ohio and resigned in 1861 to establish with Matthew Addy the iron and cotton firm of Addy, Hull & Co., Cincinnati. Mr. Hull, having served in the civil war as one of President Lincoln's ninety-day men, and later in the United States quartermaster's department at Cincinnati, became the bookkeeper of Addy, Hull & Co., and in 1865 was admitted to partnership. In 1871, he withdrew and founded the iron house of Geo. H. Hull & Co., of Louisville.

There was little system in the iron business those days. Iron came down from the Hanging Rock region to Cincinnati chiefly in flat boats containing about 250 tons. This iron was unloaded and stored in Cincinnati and re-shipped from there. After a boat load was sold, which might be in a day or many months, the commission merchant accounted for it, but did not give the seller the name of the buyer, or vice versa. Mr. Hull systematized the business and invented the sales memorandum, which now is used generally in the iron business of this country. As far as possible, he sold and shipped all iron directly to a consumer, giving the seller the name of the buyer and vice versa. This custom now has become general.

In 1890 at the request of southern iron producers he devised the present warrant system of the American Pig Iron Storage Warrant Co., and organized that company, becoming its president, in which capacity he has served ever since. Millions of tons of iron have been bought and sold in the form of American warrants.

Mr. Hull was born in Dansville, N. Y., Nov. 22, 1840, and was educated in the public schools at Sandusky, O., and in the Genessee and Wyoming Academy, Alexandria, N. Y. He is a member of various patriotic and other organizations and has made important contributions to economic literature, including a work on "Industrial Depressions".

when production exceeds consumption. Thus a second demand for pig iron is created in Great Britain which does not exist in the United States, and this second demand is only a little less urgent than the ocnsumers' demand. The consumer must have iron to melt or stop his works. The warrant dealer must accumulate warrants to meet his calls for deliveries or cease business. Of course, if this warrant accumulation were thrown on the consumers' market in Great Britain during dull periods, it would have a disastrous effect upon prices, but this never occurs, for the warrant demand is never satisfied. It keeps on accumulating until the active times come when producers cannot possibly supply the consumers' demand. Then the consumers bid prices up until they get what they need. There has been no time in the 75 years' existence of the warrant system in Great Britain that the warrant dealers have been able to get as much iron as they desired, no matter how long or how depressed the dull period was. This warrant demand does away with any necessity of the producer borrowing on surplus iron, or of going to the consumer and asking him into buy iron. The British producer is never forced to press his iron on the consumer. The producers all assert that if they did it, iron prices, during dull periods, would go down in Great Britain just as they do in the United States.

Now see how diametrically opposite conditions are in America. The producers not only are pressing their iron on the consumers all through the dull periods, but they employ travelers or agents to go to consumers' works and urge them to buy. They are not only willing to sell for prompt delivery as they do in Great Britain, but will contract for future delivery six months or a year ahead, thus giving protection for that time *free of charge*. When the demand is greater than the supply, this pressing iron on the consumer of course is not disastrous to prices, but when the supply exceeds the consumers' demand, the American selling custom only hammers prices down, without adding to the total volume of sales and this keeps on all through the years of depression until enough furnaces go into bankruptcy, or stop voluntarily and thus bring about an equilibrium.

The time is now ripe for introducing the system. For a century or more, the warehouse laws of the different states have been all the way from very indifferent to very bad ones. Many of the provisions of these old state laws protected the careless sellers of goods on credit or the careless owners of warehouse receipts, or the careless warehousemen, at the expense of the party who loaned on the receipts. Another serious objection in all of the states, under the old law, was that the goods were liable to be attached, garnisheed and possibly delivered to the attaching creditor on his executing a bond for the same. The result was that many bankers would not loan on warehouse receipts at all. The new uniform warehouse receipt act, which now has been adopted by various states, aims to correct all known objections to the old laws, and a warehouse receipt legally issued under the new law by a genuine warehouseman should now take rank among collateral of the highest order. Money now is so plentiful, and the warehouse laws so admirable that banks are seeking loans on warehouse receipts. In fact some of them are so glad to loan on commodity securities, that they are taking so-called warehouse receipts, which are of the most doubtful value. Great harm is bound to come to the iron interests if these spasmodic speculative sales and so-called warehouse receipts are allowed to increase.

A movement to bring all the American furnaces which make iron for sale, into the warrant system should be taken up as quickly as possible. Americans are financially able and eager to capture their share of the world's big foreign business, but as long as Great Britain has its universally-used warrant system and America has not, we cannot compete with her in the big foreign contracts which require vast quantities of materials and a number of years to complete. In fact, no country in the past has been able to compete with Great Britain for the world's big business, and it is chiefly because of her warrant system. An account of one of her many transactions of this nature should make clear England's advantage over all her competitors.

When the war closes, the devastated territories of Europe will be rapidly rebuilt. Do not listen to the unthinking who tell you that the countries now at war will be exhausted and that Belgium, France, etc., will have no money to rebuild. It is true that the wealth of these destroyed districts has been swept away. So was the wealth of Chicago and San Francisco swept away by their great fires. But the value of these devastated localities has been demonstrated, and the world's surplus wealth will flow into and rebuild them quickly, just as Chicago and San Francisco were rebuilt quickly. The billions of money borrowed by the nations at war have not been destroyed; it has been paid out to its workers, who have never before earned such vast sums.

The volume of business created by the rebuilding of the devastated districts will be greater than the world has ever before seen. If Americans, in the meantime, acquire what Childs calls "international sense," and provide themselves with the requisite international business machinery to compete for this great business, they may have their full share of it. If not, they must be satisfied with what England is obliged to buy here to carry out her contracts for the world's big business.

Pond Truss for Buildings

Steel sashes, rolled steel skylights and other apparatus to supply proper ventilation, and to admit sufficient light to industrial buildings are treated in a 100-page catalog issued by the David Lupton's Sons Co., Philadelphia. The booklet contains reproductions of photographs of buildings built for the Ford Motor Co., B. F. Goodrich Co., Remington Arms-Union Metallic Cartridge Co., Mercer Automobile Co., Erie Malleable Iron Co., John A. Roebling's Sons Co. and others.

The Lupton company has perfected a type of roof known as the Pond truss, particularly adapted to buildings where large volumes of hot air and gas are produced, such as foundries and forge shops. The roof surfaces slope upward to wide outlets, the series of sash being hung in the outer walls of the monitor. The width of the inverted portion of the roof depends on the particular requirements of the installation, but is usually about one-half the building width. The rapid flow of air is continuous as long as heat is developed in the building. In a foundry the cold air enters through the side wall openings, and, falling to the floor, flows between the walls until it becomes heated, when it rises and follows the roof slopes to the open monitor sash. It is claimed that there is a total absence of heat pockets, return currents and down drafts.

It is said the sash in the truss is so located as to insure an even overhead light through the center of the building. The combination of vertical and sloping lines of sash is said to increase the distribution of light and to facilitate the escape of the heated air. At midday the roof sash line protects the interior from the direct rays of the sun.

Cost Versus Up-Keep of Mill Motors

The Advisability of Increasing the Original Expense of Equipment to Reduce the Maintenance Costs is Presented by the Author of This Article—Direct-Current Motors Form the Basis of the Discussion

BY A. M. MAC CUTCHEON

THE intelligent purchaser of electrical apparatus considers not only the first cost but gives equal consideration to the question of depreciation and upkeep. If it were possible to select a motor with minimum first cost as well as minimum depreciation and upkeep, the problem would be solved and all discussion ended. There is no doubt that it would be greatly to the interest of any manufacturer to design and build such a motor.

In a well-balanced design, maximum quality is inconsistent with minimum cost and the wise user selects the machine that represents the most desirable compromise between the two for his particular work. The nature of the application largely influences his decision. The ideal motor for driving a ventilating fan falls far short when applied to a threading machine.

Present day practice has already classified types to a certain extent. There is the well-known split frame, steel mill motor as distinguished from the commercial general-service motor. Classification cannot be carried to an extreme as all standardization would disappear and the balance between cost and quality be destroyed. On the other hand, whenever the demand for further classification becomes sufficiently insistent, the demand must be recognized and met.

Mills Impose Severe Service

No class of service requires a higher quality article than the service in steel mills. Whether general service motors shall be subdivided into two classes, one high in quality but necessarily higher in cost, can be answered only by the steel companies themselves. "The user must pay." The selling price represents the cost of materials, labor and overhead with a reasonable profit to the capital invested. As long as the buyer purchases from the standpoint of price alone, the attempt of the manufacturer will be to cheapen the motor as far as possible; with the minimum sacrifice in quality it is true, but the sacrifice will be present. Often the problem is complicated by the natural optimism of the purchaser coupled with the Yankee desire to drive a shrewd bargain. Under the representation of the interested and interesting salesman, whose price is a little lower than his competitor, the buyer wishes to believe that the less expensive article is equal in quality and finally decides to take a chance. Still further complication results from the very natural view of the purchasing agent that all material should be secured at the lowest possible price.

In recommending a particular article at an increased cost, the engineer must be sure of the fundamental correctness of his conclusion. It is necessary to carefully balance the higher cost against the extra hazard. The problem is a knotty one due to the difficulty of properly evaluating the cost of repair and possible failure. Here the manufacturer can be of little assistance as the steel mill electrical engineer should be the instructor and the designing engineer the pupil. But in considering the increased cost of the motor to be purchased, the steel mill engineer has possibly lacked detailed information as to the effect on the cost of those features which he may desire and here the manufacturer should lend his assistance. One change in design resulting in an increased cost may be counterbalanced by another change meaning a decrease in cost.

To easily consider the problem, the assumption will be made that the design is a well-balanced one. The increase in cost resulting from an increase in quality will be expressed as a percentage of the total cost of the motor. The total cost will be referred to as the basic cost, each feature will be isolated from all others. The size of motor selected has an output of 15 horsepower at 850 revolutions per minute, which corresponds to a machine tool rating of 10 horsepower at 400 to 1,600 revolutions per minute. Fluctuations in the market price of material and labor will be neglected.

Recent discussion has centered largely upon permissible heating, the consideration of which is beyond the scope of this paper. With increase in heating limits there is no question that the cost of the motor may be decreased without sacrifice of mechanical quality. But it should be borne in mind that the decrease in cost is likely to be secured by rating up each frame size, which means that the decrease in cost is accompanied by a decrease in mechanical quality.

To reduce the heating of the shunt fields in this typical motor 5 degrees, by the use of extra material means an increase of 1.3 per cent in the total cost. This figure makes no allowance for the possibility of having to increase the over-all dimensions to provide room for the extra material. Decrease in the interpole coil temperature of 5 degrees under the same conditions adds 0.57 per cent. Five degrees lower heating in the armature penalizes the total cost 0.70 per cent due to the larger copper used. Here it is impossible to achieve the result only by the use of extra copper. The core must be made larger in diameter or longer which possibly means a further 0.5 per cent.

A lower core temperature may be secured by using a higher priced and lower loss steel which means 0.3 per cent for 5 degrees; or by using a greater volume of the same steel which results in a larger armature. The extra steel represents 0.3 per cent and the influence of the larger armature upon the rest of the machine 0.5 per cent.

Heating Constitutes Big Problem

In the foregoing no consideration was given to the decrease in heating due to improved ventilation. If such improved ventilation can be secured a tremendous saving in material is possible for the same rise. This saving is difficult to evaluate as the question of temperature rise in motors, more or less effectively ventilated, is the problem in design most uncertain in prediction. To secure some idea, we may consider the fully enclosed motor of the same rating with its 37 per cent increase in cost.

Efficiency is closely allied to heating. A decrease in heating due to a decrease in loss means an increase in efficiency. This increase in efficiency does not result when improved heating is due to improved ventila-

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tion or increased radiating surface. It is self-evident that increased efficiency not only lowers the coal bill but makes possible a smaller investment in generating equipment. Information is not at hand to predict accurately the saving in these two items. However, assuming the cost of power as 1 cent per kilowatt hour, an increase in efficiency from 86 per cent to 87 per cent on a 15-horsepower, 850 revolutions per minute motor operating at 75 per cent load eight hours per day, 300 days per year, results in a decrease of 300 kilowatt-hours or a saving of approximately 1.3 per cent of the basic motor cost. With a pro rata distribution of the decrease in losses, the cost penalty for the 1 per cent improvement in efficiency is 3.3 per cent of the basic cost. An increase in efficiency from 88 per cent to 89 per cent would probably incur a 50 per cent greater penalty.

In the case under consideration, frame material represents 7½ per cent of the basic cost. Decrease in active magnetic material may be secured by the use of a higher grade steel or an increase in shunt field excitation. As compared with the present day practice, the latter method would penalize the cost rather than decrease it and will, therefore, be neglected. The improvement in magnetic quality of steel refined in the electrical furnace is an interesting problem now being actively considered by several steel companies, but the work is still in an experimental stage. The use of rolled steel permits of a lighter frame with equal magnetic quality but no cost figures are available. Considering present commercial cast steel, no lessening in cost is probable from a decrease in magnetic section which represents 76 per cent of the total frame weight, the remaining 24 per cent covers the frame supports. Increasing their weight by 20 per cent results in a 0.4 per cent increased basic cost. A liberal eye-bolt over a small one adds 0.08 per cent and 0.19 per cent over none at all.

A direct increase of 15 per cent in the weight of the end yoke adds 0.6 per cent to the cost of the motor. A great deal can be accomplished in lightening the yoke without sacrifice in strength by proper design. U-section arms are practically universal. A large oil well and bearing housing penalizes the cost not only by increasing weight but by shutting off ventilation. A 15 per cent larger housing accounts for a 0.2 per cent increase in cost, while the effect on ventilation cannot be readily estimated. A large size oil gage and pipe thereto represents but 0.1 per cent of the basic cost with advantages out of all proportion.

Probably no other class of user so generally demands a split bearing at the pinion end as do mill engineers. Its advantages in mill work are obvious but must be paid for. The increase in cost depends upon the type and we would place it at 4 per cent for the pinion end alone.

The commutator has been referred to as the heart of the direct current motor, both because all life current emanates therefrom and because trouble in the commutator will most quickly cause a cessation of all activity. Many a motor continues to operate for a long while with a bad commutator as many a man with a weak heart lives to an old age, but neither is considered a good risk. Mechanical defects will cause poor commutation as readily as electrical ones. We have seen a motor that was sparking viciously have the trouble entirely eliminated by tightening and turning the commutator. Commutator troubles are cumulative, rapidly going from bad to worse.

First considering mechanical features, a 30 degree angle with the same depth of bar affords a better grip than 45 degrees but costs more to machine by a slight amount, approximately 0.15 per cent. Increase in grip by increasing bar depth ⅛-inch raises cost 0.4 per cent. A riser or tail is a convenience in rewinding and probably results in better first soldering and costs 0.45 per cent. Increase of ⅛-inch in wearing depth must be paid for to the extent of 0.4 per cent. Five per cent increase in the number of bars adds to the cost of assembling the commutator and winding the armature 0.25 per cent of the basic cost. Per-pound mica is the most expensive material you find in your motor. Improved creepage distance over the commutator collar of ¼-inch should be charged up at 0.1 per cent and 0.035 mica instead of 0.025 means 0.6 per cent cost increase. A special varnish treatment in the V is a reasonably cheap form of improving the insulation, as it can be secured at 1 per cent of the motor cost.

There are many points of quality which we have not attempted to evaluate. We wish to emphasize that the figures we have used depend upon a limited investigation and are based upon a comparatively isolated case. These points to which we particularly refer were selected as points on which from time to time, steel mill engineers have expressed themselves as desiring that some improvement in quality should be made.

Standardization of Machine Tools

(*Continued from page* 1201)

for 15 and 45, 16 and 44, 17 and 43, 18 and 42, etc.

On completion of this repeated operation we at once discover that the closest coincidence between the marks on both sides of the line *ab* is for the two sets of gears 65/15 and 34/26, whose combined ratio is 5.6667, which is less than 0.2 of one per cent greater than 5.6568.

It will also be seen that the two combinations $\frac{59}{21}\times\frac{40}{20}$ and $\frac{58}{22}\times\frac{41}{19}$ come quite close to the required ratio.

Standard Feed and Speed Series

Of course, special requirements may often complicate a problem of this kind in various ways, but the method described can always be used as a help in its solution. However, no further consideration will be given the matter here.

To further emphasize how even some fair attempts at regular progressions of speeds and feeds have fallen short of what might have been attained, Figs. 4, 5 and 6 show a few of numerous cases that have been investigated by the writer. Fig. 7 also shows how even an excellent speed series may be further improved.

What has been said above in discussing the adoption of a standard speed series, holds equally good about a standard feed series, except for the most up-to-date designs of lathes, in which the feeds for plain turning are obtained as a constant fraction of the screw-cutting feeds. For these latter it is suggested that both the cross feeds and the longitudinal feeds be made the same fraction of the screw-cutting feeds for all lathes regardless of size.

Tool Posts for Lathes

In Fig. 8 are shown proportions for the swivel form of the tool post for moderate-sized lathes which the writer has used as a standard for several years past. The most essential part of this, as regards size, is the width of the slot, which is for a tool body of approximately 1/30 of the swing of the lathe over the bed, and a distance from the center of the lathe to the tool-supporting plate that corresponds to the ground height of the roughing tools. The propriety of these propositions is decidedly open to discussion, particularly the latter.

T-Slots

An exceedingly important part of the machine equipment of a shop are T-slots in various machines, and the writer has also spent a great deal of money in bringing these to a stand-

ard, a matter that has at times meant entirely new face plates or tables for some machines.

A great many years ago experiments were made by William Sellers & Co. to ascertain the strength of T-slots relatively to a T-headed bolt, and on the strength of these, that company adopted a standardized set of slots, which, as later modified by the writer, have also been used by him for several years past. They are shown in Fig. 9.

It is well known that the Morse standard sockets are no standards at all, but a perpetuated, laudable, but unsuccessful attempt of years ago to establish standards. However, compelled for the time being to accept them as they are, everybody has now at least two standard tapers for sockets and shanks to contend with, namely, the Morse, and the Brown and Sharpe. The best the writer has been able to do, therefore, has been to make all lathe centers conform to a Morse standard, so as to enable drills or drill sockets to be directly inserted in either spindle of certain or all lathes in a shop; and to make all milling-machine sockets conform to the Brown and Sharpe standard, with Morse drill sockets having Brown and Sharpe shanks for use with these, whenever holes have to be drilled in a milling machine.

The writer unqualifiedly recommends the universal adoption of the Brown and Sharpe standards all around, and the use of Morse sockets with Brown and Sharpe shanks during the change. He also recommends the universal abandonment of the tang as a means of driving. We have now for years had the ridiculous inconsistency of drillmakers, that they still furnish taper-shank drills with the old-style tang as a means of driving, and along with this extensively advertise and sell various forms of "use-them-up" sockets for drills with the original tang broken off.

More than 12 years ago the writer adopted a modification of William Sellers & Co.'s key method of driving as a substitute for the tang of drills, arbor and boring-bar shanks. This is illustrated in Fig. 10, and differs from the Sellers method in the special form of key, which has become somewhat known as the Barth key. The virtue of this as a means of driving consists in its being subjected to crushing pressures only, and that it has no tendency to work out of its seat; and for a taper-drill socket it has the additional great advantage over the Sellers straight key, that the drill shank can be inserted rapidly without any special care.

Hardening of Gun Tubes

(*Continued from page* 1205.)

tral hole, on the outer edge of the plug, and on two periods stamped at an angle of 45 degrees. The period was strongly cold-worked on one side and the change was well marked.

The plug was again placed in service for 100 rounds and then returned for examination. The result is shown in Fig. 12, which is the letter *V* impressed at 5,000 pounds. It will be noticed that the transformation has proceeded to its final stage, namely, the light etching structure which had previously been shown to be martensite.

These experiments seem to prove that the hardness of the surface of a gun tube as well as the pressure plug is due to a combination of mechanical deformation and a process of martensitization. This process requires time, and the development takes place in stages. Even in the early stages there was evidence of heat cracking before the change of structure had taken place. When the structure begins to change it first shows as troostite, and then develops into martensite, but the latter is amorphous in form. Temperature and work are also important factors. The transformation takes place with the greatest rapidity where the work has been most severe.

These factors counterbalance each other in the gun to a certain extent. In the powder chamber there is the maximum temperature, but the minimum amount of work. The only work which has been done upon the metal here is the original machining of the gun. In section *E* where the rifling begins, the maximum amount of cold work is done. The rotating band is undeformed and the whole surface bears on the rifling. This is also true of section *D*, but in each section toward the muzzle there is a decreasing amount of work due to the grooving of the rotating band until at the muzzle end the driving edge alone receives work.

The reason that a cold-worked metal is more susceptible to the sorbite—troostite—martensite change when exposed to firing is not clear. There may, however, be two factors at work: 1. Beilby has shown that mechanical deformation of any kind produces an amorphous state in the metal, and it is entirely possible that the amorphous metal may be more sensitive to the reaction, that is, it may have greater solvent power for iron carbide. He has shown, and many others have confirmed the observation, that such metal has a greater solution pressure and, it is possible that it may have greater dissolving power for iron carbide.

Spring has shown that certain reactions, which ordinarily take place when under the influence of heat, can be made to take place at the ordinary temperature when under the influence of pressures. Thus he caused dry sodium carbonate to react with dry barium sulphate with the formation of sodium sulphate and barium carbonate. He also caused powdered zinc to alloy with finely divided copper to form brass. In each case precautions were taken to eliminate any heat effects.

In a gun the original metal is sorbitic and the iron carbide is therefore mostly in the free form, only a minimum amount being held in solid solution. When subjected to the pressure of cold work, or the pressure of the explosion at a high temperature, solution may take place, each round of firing adding to the amount which goes into solution. This would lead naturally to the formation, first, of troostite, and when the solution is complete, of martensite. These steps are actually observed.

Either hypothesis—solution in amorphous metal, or solution by pressure—may explain the phenomena observed but the latter seems the more likely. This would more adequately explain the fact that in erosion tests of steels of various composition, those steels high in nickel or manganese show the greatest amount of martensite formation. In these steels the Ar_1 point is lowered slightly, thus increasing the tendency for the carbide carbon to be held in solid solution form. Thus, in one case, a 3.50 per cent nickel steel showed a martensite surface 0.05-inch in depth, while under exactly similar conditions a plain carbon steel showed only 0.004-inch. Nickel and manganese lower the Ac_1 point, and hence make it easier for the sorbite—troostite—martensite transformation.

Experiments are now in progress with alloy-steel pressure plugs to see whether or not the hard surface develops more rapidly with them than with plain carbon steels. It is highly probable that those steels having the highest Ac_1 point will show hardening the least rapidly. A convenient means of testing this is to make up a series of steels into the form of small screws, stamp some letters at 5,000 pounds pressure, place them in the mushroom head of the breech block and make observations after firing. The preceding work was carried on at the Watertown arsenal and the writer wishes to express his appreciation of Colonel Wheeler's interest and courtesy.

Valuation Discussed by Engineers

Interest at Annual Meeting of A. S. M. E. Centers on Industrial Valuation and Scientific Management—Codes for Traveling Cranes and Boilers Receive Attention

THAT the engineer's influence is bound to extend far beyond the conventional limits of the profession was emphasized in the sessions of the thirty-seventh annual meeting of the American Society of Mechanical Engineers at New York, Dec. 5 to 8. Scientific management, industrial valuation, safety regulations for cranes and boilers—all subjects outside the old recognized limits of mechanical engineering, claimed most of the attention of the 1,500 members and guests of the society in attendance. The feeling that the engineering profession must take up a larger proportion of the burden of national affairs was expressed by several different speakers and the evidence that engineers are eager to assume this added responsibility was furnished by the unusual interest displayed in the subjects of general application.

In attendance, enthusiasm, and general merit of the papers read, the meeting surpassed those of past years. The arrangement of simultaneous sessions made it possible to include an unusually large number of papers on the program without extending the time of each session beyond its allotted period.

The committee meetings on Tuesday and the presidential address and reception reported in the last issue of *The Iron Trade Review* paved the way for an unusually comprehensive program of professional papers on Wednesday. In the brief business meeting preceding the technical sessions, the council of the society, represented by William N. Dickinson, submitted its annual report. Statistics on membership submitted with the report show that during the fiscal year ending Sept. 30, 1916, the net gain in membership was 667. Including 841 affiliated students, the total roll of the society on October 1 contained 8,085 names. The reports of various special and standing committees incorporated in the report of the council show that the activities of the society have been extended over a wider field than ever before and that much work of benefit to the nation has been accomplished. The part played by the society in the industrial preparedness movement, the valuable work being done by the boiler code committee, and the service rendered the country through the discussion of timely subjects are evidences to be found in the report that indicate the value of the society's activities to the country.

Twenty-two professional papers were scheduled for the seven sessions held Wednesday. George A. Orrok, mechanical engineer, New York Edison Co., New York, read a paper on the proportioning of surface condensers. The results of experiments of the author and of others leads him to believe that the law of temperature rise in a condenser tube is of the exponential form, with 0.875 as the exponent. Mr. Orrok thinks it is unnecessary to consider viscosity in designing if the water temperature is from 65 to 70 degrees Fahr. and the vacuum is 28 inches or over. The critical velocity may be disregarded, since all condenser velocities are far above it. Mr. Orrok outlined his method for designing and discussed the principles of the formulas employed.

L. P. Breckenridge, professor of mechanical engineering, Sheffield Scientific School, Yale University, New Haven, Conn., and D. B. Prentice, assistant instructor in the same institution, presented a paper entitled "The Testing of House-Heating Boilers."

Water for Boilers

"Water for Steam Boilers," a paper by Dr. Arthur C. Scott, president Scott Consulting Engineering Co., Dallas, Tex., and J. R. Bailey, professor of organic chemistry, University of Texas, was read in abstract by Secretary Calvin W. Rice. The authors consider the characteristics of different waters used in boilers, advocate that boilers be blown-off under low pressure, and contend that boiler compounds are more expensive than methods employed to purify the water before it enters the boiler. In the ensuing discussion, William Kent, consulting engineer, Montclair, N. J., deplored the fact that in spite of the number of capable chemical engineers in the country, users of boilers are still trying to "cure the water with patent medicine." Mr. Kent and several other speakers took exception to a number of statements made by the authors.

Proposed Code for Cranes

The industrial safety session held Wednesday morning was devoted to a discussion of the code of safety standards for cranes proposed by the subcommittee on the protection of industrial workers. The session was in charge of John H. Barr, consulting engineer, Remington Typewriter Co., New York. In the absence of John P. Jackson, commissioner, department of labor and industry, Harrisburg, Pa., Lew R. Palmer, chief inspector of the department, outlined the principle provisions in the proposed code. The code consists of 40 regulations covering details of construction, 22 rules for operators, six rules for floormen and six rules for repairmen. The final code will be published in *The Iron Trade Review* when it has been adopted by the subcommittee. The provisions in the proposed code that provoked discussion were the following:

General Construction

2.—All apparatus shall hereafter be designed throughout with not less than the following factors of safety, under static full rated load stresses, based on the ultimate strength of the material used:

a.—All gears, and complete mechanism, factor of not less than eight (8).
b.—All other parts, factor of not less than five (5).

4.—Cranes should be of what is known as "All steel construction;" no cast iron should be used except for such parts as drums, bearings, brackets, etc. No combustible material should be used.

12.—On all cranes hereafter erected no openings shall be permitted between the bridge footwalks and the crane girder. When wire mesh is used the mesh opening must not be greater than one-half (½) inch.

17.—An approved foot- or hand-operated gong, or other effective warning signal, shall be placed in a location convenient to the operator and be securely fastened.

Operation of Cranes

Rules for Operators

6.—The operator or some one specially designated shall properly lubricate all working parts of the crane.

18.—When handling maximum loads, particularly ladles of molten metal, the operator shall test the hoist brakes after the load has been lifted a few inches; if the brakes do not hold, the load should be lowered at once and the brakes adjusted or repaired.

Rules for Floormen

1.—Floormen shall give all signals to the operator in accordance with approved standards, preferably manual.

Rules for Repairmen

6.—Repairs shall not be considered complete until all guards and safety devices have been put in place and the block and tackle and other loose material have been removed.

Arthur M. Greene Jr., professor of mechanical engineering Rensselaer Polytechnic Institute, Troy, N. Y., stated that from the standpoint of machine design the factor of safety of five prescribed in paragraph two seemed low. Mr. Palmer, in defending the proposed factor of safety said that the figure had been unanimously approved by the firms and individuals who assisted in preparing the code. The wide range of experience represented in this approval was considered ample testimony of the correctness of the factor, said Mr. Palmer.

Prof. Greene declared that the word "brackets" in paragraph four should be

modified so that the restriction on the use of cast iron would be more specific. He also asked if an automatic gong which would sound whenever the crane is in motion would not be preferable to the hand-operated gong specified in paragraph 17. This question received a negative answer, several speakers defending the provision in the code on the ground that an automatic gong in a busy shop soon loses its power to draw the attention of the men on the floor. The crane operator, by a judicious use of the hand- or foot-operated gong, is best able to effectively warn workers below of the approach of the crane.

The rule for lubricating the working parts of the crane, paragraph six, provoked some discussion. Prof. Greene thought that a definite interval between lubrication periods should be specified. Other speakers were willing to leave the question of proper lubrication to the foreman, it being his duty to see that the work is properly performed. All speakers agreed that it was extremely necessary that the lubrication be definitely assigned to a responsible workman.

Dr. Frederick R. Hutton, emeritus professor of mechanical engineering, Columbia University, New York, made a number of suggestions regarding the wording of the provisions. He showed that the meaning could be made clearer in a few cases by making slight changes in construction of the sentences. He also suggested that in arranging the final draft of the code, the paragraphs be numbered in series of one to 99, 100 to 199, 200 to 299, etc., thereby avoiding duplicate numbers which are confusing.

Paragraph one, under "Rules for floormen" was freely discussed. In reply to speakers defending the manual method of signaling, Henry A. Hale Jr., manager bureau of safety, American Mutual Liability Insurance Co., Boston, cited a case in Massachusetts wherein a floorman tried to collect compensation for an injury to his arm. In the investigation of this accident it developed that the existing method of calling the craneman was to throw a light object up into the cage to attract his attention. In the case in question the craneman became angry when the floorman hurled an object at him, and he promptly retaliated by throwing a file at the man below, injuring his arm. H. M. Elder, general power engineer, American Locomotive Co., Richmond, Va., described the system of air whistles employed to call cranes in the American Locomotive Co. plants. A. F. Blasdell, manufacturing superintendent, General Electric Co., Pittsfield, Mass., advocated a rule that floormen at all times precede a crane load to give warning to other workers. He said that in a number of instances he had megaphones placed in the operator's cage to assist the craneman in talking to the floormen. He also told of the practice of painting the crane hook white to make it easily distinguishable when in dark corners. Allen D. Risteen, engineer, Travelers Insurance Co., Hartford, Conn., advised that a provision be added to the code to prevent operators from taking up the slack too suddenly. Henry A. Hale Jr., suggested that handles be placed on the back of crane hooks to lessen the danger of injuring the hands of the floormen while arranging chains or slings. Dr. Hutton declared that the word "hitch" is a local term and suggested that the word "sling" or the combination, "hitches and slings" would be more clearly understood. John W. Upp, manager switchboard department, General Electric Co., Schenectady, N. Y., spoke briefly on the attitude of manufacturers and legislators toward the attempt of the society to recommend a code. He said that there had been a doubt in the minds of many as to the extent to which the practical men would allow an engineering society to go in suggesting standards. The work of the sub-committee, Mr. Upp said, has shown that there is perfect harmony all around and that state and federal authorities and manufacturers are ever urging the engineering societies to go still deeper into their problems.

Utilization of Waste Heat

An abstract of a paper entitled "The Utilization of Waste Heat for Steam Generating Purposes," by Arthur D. Pratt, Babcock & Wilcox Co., New York, was read by Secretary Calvin W. Rice. This paper appeared in the Dec. 7 issue of *The Iron Trade Review*.

"Graphic Methods of Analysis in the Design and Operation of Steam Power Plants," is the title of a paper prepared by R. J. S. Pigott, power engineer, Remington Arms-Union Metallic Cartridge Co., Bridgeport, Conn. The author states that graphic methods may be employed in the design of new plants when they are based upon anticipated load curves and in the operation of existing plants to determine the efficiency of operation from plant records. Mr. Pigott used the data guaranteed by the makers of apparatus for the seventy-fourth street station of the Interborough Rapid Transit Co., New York, to illustrate the first application, and for the second, he cited operating statistics on the operation of the power plant of the Remington company. The author believes that the use of graphic methods will shorten the labor in power-plant design.

Victor J. Azbe, St. Louis, in a paper on power plant efficiency, called attention to the preventable wastes in power plants. He states that losses amounting to about 30 per cent, due to lack of foresight and business ability, improper design, and improper management and inefficient operation, may be eliminated by employing efficient methods of operation and by installing the proper equipment. Economizers, pure feed water, preheated furnace air, utilization of exhaust steam, and a more general use of superheated steam are mentioned as important factors in increasing plant efficiency.

Sanford A. Moss, engineer turbine research department, General Electric Co., West Lynn, Mass., presented a paper in which the uses of the impact tube are discussed. Hubert B. Reynolds, assistant engineer, motive power department, Interborough Rapid Transit Co., New York, read a paper on the flow of air and steam through orifices.

In the textile session, papers were presented by Arthur N. Sheldon, Providence, R. I.; Frederick J. Hoxie, engineer, Associated Factory Mutual Insurance companies, Boston; and G. H. Perkins, head of textile engineering, Lowell Textile School, Lowell, Mass. Mr. Sheldon's paper contains the results of tests made to determine the amount of heat transmitted through various types of sash. He shows that the heat loss is greater through single-glazed sash than through double-glazed, that it is greater through metal than through wooden sash, and that in double-glazed sash it decreases with increased air spacing between the panes of glass.

The great interest in the subject of industrial management swelled the attendance at the session devoted to that topic beyond the seating capacity of the assembly room. E. E. Barney, superintendent Remington Typewriter Works, Ilion, N. Y., spoke briefly on how to secure the co-operation of workmen. W. S. Rogers, president Bantam Anti-Friction Co., Bantam, Mass., related his experiences in entering a small business when its prospects were not bright, and gradually establishing it on an efficient and investment-paying basis. He placed special emphasis upon the fact that a business directed solely by the financial interests involved usually does not thrive. He described the organization of his company wherein the men in charge of departments form a "house of representatives"; the higher executives, a "senate"; with the two bodies supplanting the usual board of directors. The members of both bodies are interested in the company financially, but the policy has been to place the problem of getting the work out before that of earning dividends. Mr. Rogers cited an incident that showed the loyalty of his men. One morning when a fire in a building nearly half a

mile from the plant threatened to spread, the speaker saw one of his Italian employes on the roof of the factory with a bucket of water. When asked why he didn't go to the scene of the fire to assist the fire fighters, he replied:

"Stay here, sava da job."

Mr. Rogers said that the incident is typical of the co-operative spirit in the rank and file of the organization.

Value of Graphic Records

Frank B. Gilbreth, president Frank B. Gilbreth, Inc., New York, spoke on "Graphical Control on the Exception Principle for Executives." He mentioned the fact that many executives, although eager to enforce efficiency all along the line, are strongly opposed to adopting efficiency regulations for themselves. Executives should make decisions, not motions, yet too many officials waste their time by doing the work a clerk should do. Graphic methods are the first step in checking the efficiency of the man who is in charge of the business. The speaker deplored the fact that many manufacturers think they have reached the ultimate goal in efficiency because they receive charted records of production and operation. The records are worthless, he said, unless the fluctuations revealed by them are investigated. Graphic records should show the planned output, the actual output, the planned cost, the actual cost, and the causes for the deviation from the anticipated values. Executives should form the habit of using charts instead of relying upon personal observation. Observed facts are not always typical. The chart system is developing slowly in this country, and although many charts are prepared, their value is lost because the information contained in them is not properly utilized.

Progressive averages are valuable to an executive. His duty is to investigate conditions indicated by the averages, and to remove the factor which spoils the averages. Many officers feel that graphic records require too much of their attention. This objection is overruled by the plan whereby certain limiting zones are designated by the executive. As long as the plotted points of the chart fall within the zone, the executive is not to be disturbed. If the points fall without the zone, the chart is submitted to him for his investigation. This system, however, should provide for cases of unexpected efficiency, as it is important that the man in charge know what has caused the unusually good showing.

Sanford E. Thompson, consulting engineer, Boston, spoke on the standardization of industrial management. He reviewed the great work of standardization that has already been accomplished in the United States. Methods are good, bad and indifferent, as are machines. There is always a *best* way to do a certain thing, and the *best* method naturally should be the *standard* method. Mr. Thompson mentioned a number of instances of misguided efficiency work, due to improper methods, and from these cases, built up a strong argument for standard methods of industrial management.

Carl G. Barth, Carl G. Barth & Son, Philadelphia, presented a paper on the standardization of machine tools. He showed by means of logarithmic-plotted charts a number of speed and feed series, one of which is the author's ideal. The design of tool posts and standards for lathe centers and drill press and milling machine sockets were discussed. Mr. Barth's paper appears on page 1199 of this issue of *The Iron Trade Review.*

H. K. Hathaway, consulting engineer, Philadelphia, gave a paper proposing a plan for the activities of sub-committee of engineering societies. The author's suggestions are plainly intended to apply to the A. S. M. E. committee on machine shop practice. He believes the committee should work out a definite plan of action for procuring from the members the best qualified papers dealing with each subject. The machine shop field should be divided, each subdivision being properly classified and codified. Mr. Hathaway declares that a permanent secretary, who would devote his time to the work of the committee would increase the effectiveness of the organization.

Valuation Sessions

More interest was displayed in the valuation sessions than in any other feature of the annual meeting. Each paper presented was thoroughly discussed, and in the arguments that developed, not only the immediate subject, but various allied topics were given considerable attention.

John G. Morse, appraiser, Associated Factory Mutual Fire Insurance companies, Boston, outlined a short method for accurately appraising industrial propery. This paper, entitled, "Accurate Appraisals by Short Methods", appeared on page 1142 of the Dec. 7 issue of *The Iron Trade Review.* A paper prepared by Charles Piez, president of the Link-Belt Co., Chicago, dealing with the relation between perpetual inventory value and appraisal value, was read by Secretary Calvin W. Rice. This paper appeared on page 1144 of the Dec. 7 issue of *The Iron Trade Review.* John H. Gray, professor of economics, University of Minnesota, presented a paper entitled, "How Does Industrial Valuation Differ From Public Utility Valuation?" The author discusses the economic phases of the question of valuation and explains how certain industries have been taken out of the category of unrestricted private property and placed in a class known as public utilities. On account of the importance of these public-service industries to the general welfare, the author points out, states undertake to destroy all speculative chance and risk in their operation and also to prevent extortion and abuse, by confining them to a fair and steady rate of return under regulation. But such action removes an enterprise at once from the realm of value by destroying those attributes of private property out of which value grows. At the same time, regulation destroys the customary means of measuring value, even if it existed in a utility. For value is measured by earning power. But earning power depends upon the rate charged for service, and this is fixed by law and not by the economic forces and bargaining power that fix value in the only proper meaning of that term. Therefore, to attempt to ascertain value as a means of fixing a rate by public authority for such a monopoly, is, as every economist knows and every court says, to reason in a circle. Prof. Gray believes that rate-making should be fixed so that investors can receive a fair return for their money; valuation, based on physical property, or on the cost of reproduction, or on earning capacity is of no use as a factor in equitable rate making.

Henry L. Gantt, who was largely responsible for arranging the program of papers and discussions on valuation, briefly discussed Prof. Gray's paper. He said that customs, methods of doing business, etc., have so changed in the past two years, that laws that were satisfactory a few years ago, do not apply to present conditions. Our laws, he contended, should keep pace with the progress of the country. He said that the war has taught Europe that it is far better to be able to do things than to have money. Ability is the essence of Germany, and England has been forced to imitate Germany in that respect. England has learned that the government must recognize the importance of ability to do things. Mr. Gantt cited the late change in the British cabinet as evidence of England's awakening to the need of ability. Engineers must take up the responsibility of organizing the industrial forces. The rule by financial interests is passing because it has been a failure.

Carl G. Barth emphasized the principle that the selling price of the product less its cost price equals the profit. He showed that every item of expense must ultimately find its way

into the cost of the finished product. Several speakers touched upon the purpose of valuation, the principal argument being that the value of the valuation depends to some extent upon the utilization of the values after they are determined. One speaker estimated from Mr. Morse's paper that appraisal made by the short method cost less than $0.10 per $1,000 of property appraised. He showed that this is an extremely low figure and mentioned the case of appraisal of Texas railroad properties, the appraisal costing $2.00 per mile, or $0.13 per $1,000 value. Another railroad property was appraised at a cost of $6.50 per mile, or $0.404 per $1,000 value. On the other hand, it was stated that appraisal work for the New York Telephone Co., cost $6 per $1,000. It was brought out in the discussion that valuation work has been carried into needless detail because courts are not convinced that an appraisal is correct unless an overwhelming mass of evidence is produced. Several speakers expressed the opinion that the short method suggested by Mr. Morse will produce appraisal figures which are sufficiently accurate for ordinary purposes, and that it is only a matter of time until the wisdom of using such methods is generally recognized.

What is Depreciation?

The term "depreciation" was discussed at length, and the consensus of opinion seemed to be that the word is misused in many cases. One speaker showed that there are really six different meanings of the term as it is generally used. Some companies use the word to mean the actual loss in physical values, while others consider it an accounting figure to compensate for such losses. With other companies it is a retirement allowance, loss of ability to render service, etc. M. E. Cooley, dean of departments of engineering and architecture, University of Michigan, Ann Arbor, Mich., told of the importance the term "depreciation" played in the early work of the Michigan railway commission. He apologized for having dignified the term in 1900. He deplored the fact that the problem of properly determining the valuation of a property has not been solved, and cited a case wherein an old machine shop, which was to be remodeled or rebuilt was appraised at $180,000. However, to reproduce the plant required $300,000. It is difficult to state which is the fair value. He related the early construction work of a railroad. When the road and equipment is new, it is worth 100 per cent of its cost. As certain parts of the property become worn out, replacements are made to keep the road in proper condition for service. There is a certain point, where the property is worth about 85 per cent of its cost, that the maximum service is rendered. In rate-making, Dean Cooley believes the value of the property should be taken at 100 per cent, because that is what it cost to secure this maximum service, although the normal condition of the equipment, physically, makes it worth about 85 per cent of its original cost.

William Kent discussed the valuation problem briefly. He mentioned the case of the Interborough Rapid Transit Co., in which several million dollars' worth of practically new engines were scrapped to make way for turbines. He said that such cases complicate the problem of valuation. Prof. Kent also made the statement that we have not progressed rapidly in solving the problem because the owners have not been interested in the matter. Strong students are needed to perfect an equitable plan of valuation. The ideal method will be one that is just to the public.

In the afternoon session, Henry L. Gantt and Walter N. Polakov read papers dealing with the basis for determining the valuation of industrial property. Mr. Gantt's paper, "Productive Capacity a Measure of Value of an Industrial Property" appeared on page 1146 of the Dec. 7 issue of *The Iron Trade Review*, and Mr. Polakov's paper, "Value of Industrial Properties versus Valuation of Industrial Methods" appeared on page 1143 of the same issue. Most of the discussion on these papers centered about the problem of idleness expense. W. W. Crosby, Boston, admitted the good points brought out by Mr. Gantt and Mr. Polakov regarding the determination of the valuation of a plant by its productive capacity, but claimed that American manufacturers are unable to foresee changes in conditions far enough in advance to prevent the idleness evil. He asserted that if the administration maintain a definite business policy, engineers could plan to run their business without loss due to variable production. He contended that if the market could be stabilized by better laws, manufacturers would have no trouble in keeping up to capacity.

F. G. Coburn, naval constructor, United States navy, Boston, expressed the opinion that the greatest benefit to be derived from the idleness expense charts described in Mr. Gantt's paper is the increased production gained by securing fill-in work when the demand for the regular product is low. In many cases, manufacturers who consult their idleness charts, find that they can profitably secure work to place idle equipment in service, thus materially reducing the proportion of the overhead expense to be borne by other products. Mr. Coburn cited an incident in the ship repair business to show that in some lines of work, the requirements for service vary to such an extent that the idleness feature is a big problem.

H. M. Wilcox, Winchester Repeating Arms Co., New Haven, Conn., described idleness charts showing the idle machine time in the cartridge department of the Winchester company. He stated that such charts direct attention to weakness in the organization and are in reality a check on the efficiency of the management of the plant.

Proposes Allowance for Idleness

Prof. William Kent, stated that to Mr. Gantt's declaration "of first importance is the ability of the plant to accomplish the object for which it was constructed", should be added: "and to produce as cheaply and in as great a quantity as in a modern plant". Prof. Kent thinks that normal idleness should be allowed because it is impossible to foresee seasonal changes in the demand for products.

W. C. Brinton, consulting engineer, New York, raised the question of who should direct the work of preparing the charts. He said that usually the man who takes care of the charts reports to the vice president in charge of operation, and that in many cases this arrangement is the outcome of a desire on the part of this executive to get exclusive statistics. Mr. Brinton declared that when efficiency reports go to a subordinate, there is sure to be trouble. He strongly recommended the practice of sending all graphic reports to the executive in charge of the plant. Mr. Brinton also spoke of the trouble and expense of keeping a number of sets of efficiency records for various departments. He said that the work can be simplified by centralizing all of this work under one head. Tabulating machines can then be used to advantage.

H. V. R. Scheel, Passaic, N. J., stated that the outstanding features of the discussion had been the evidence that we now have a measure for the efficiency of management. The movement for better methods has been broadened from the individual efficiency of the mechanic to the general efficiency of the plant for which the management is responsible.

Gas Session

O. C. Berry, Lafayette, Ind., presented a paper describing a gas producer for bituminous fuel. The author discusses the requirements for such apparatus, and shows the application of these principles to the design of the producer described. Phillip W. Swain, New Haven, Conn., read a paper on the commercial sampling and analysis of producer gas. The author shows that

there are a number of ways, aside from making a complete gas analysis, whereby the quality of producer gas may be judged with more or less accuracy. Low carbon dioxide, determined either by an Orsat or by a recording carbon-dioxide machine, almost invariably means good gas and efficient operation. Other indicators of gas quality are the carbon monoxide, the appearance of the test flame, and the readings of a recording calorimeter. Although in the near future the standard way of determining gas quality will probably be by use of the recording calorimeter, at present both this instrument and recording carbon-dioxide machines give trouble and get out of order. Under certain favorable conditions, these instruments may furnish information of great value.

As a rule, the sample of producer gas to be analyzed should be drawn from a pipe in which there is a continuous flow of fresh gas from the main. For a correct continuous sample, a number of conditions must be observed.

1—There must be no variation in pressure in the gas entering the sampling bottle.

2—The sampling pipe must draw from the main a sample representing the average gas over the entire cross section of the main.

3—The sample should be drawn at a rate proportional to the flow of gas in the main. If the variations are not great, a sample drawn at a constant rate will approximate closely the correct sample.

There are several portable instruments on the market, modifications of the Orsat apparatus, which have means of determining not only the carbon dioxide, oxygen and carbon monoxide, but also the hydrogen, methane, and sometimes illuminants as well. In such instruments, the hydrogen and methane are usually determined by explosion with air. To avoid the various difficulties of determining carbon monoxide by absorption, the carbon monoxide may be determined by explosion with the hydrogen and methane. This involves a little more computation, but the labor may be minimized by standardizing the method and making use of a diagram which the writer has prepared.

The paper illustrates two types of portable instrument for analyzing producer gas. One of these, in a very modern and convenient form, has a bubbling pipette for rapid absorption, and can determine the carbon monoxide either by absorption or by explosion. The other is an ordinary Orsat which has been adapted to the analysis of producer gas. Such an instrument as the latter is fairly accurate, but is not as convenient and rapid in operation as an apparatus specially designed for the analysis of producer gas.

Mr. Swain's statement that the value of gas can be gaged by the carbon dioxide content was challenged by H. F. Smith, general manager, Smith Gas Power Co., Lexington, O. Mr. Smith presented figures to show that the heating value of gas with the same carbon dioxide content varied from 140 to 205 B. T. U. per cubic foot.

Robert F. Earhart, professor of physics, Ohio State University, Columbus, O., presented a paper on the ratio of the specific heats and the coefficient of viscosity of natural gas from typical fields. This paper will appear in an early issue of *The Iron Trade Review*. A. A. Potter, dean of department of engineering, Kansas State Agricultural College, Manhattan, Kas., and W. A. Buck, of the same institution, presented a paper on tests of internal combustion engines in traction machines under various conditions of service.

"Heat Treatment of Wrought Iron Chain Cables" is the title of a paper presented by F. G. Coburn, W. W. Webster and E. L. Patch. The paper is a re-statement of the graduation thesis of Messrs. Webster and Patch at the Massachusetts Institute of Technology. A description of chain making in the Boston navy yard was presented in the Jan. 6, 1916, issue of *The Iron Trade Review*. Papers presented at the steam boiler session were as follows: "An Analysis of Marine Safety Valves, with Suggestions for Repairs and Improvements," by E. F. Maas, Puget Sound, Wash.; "The Talbot Boiler," by Paul A. Talbot, president, Talbot Boiler Co., New York; and "The Downflow Type of Steam Boiler," by John C. Parker, general manager, Parker Boiler Co., Philadelphia.

The following papers were presented at the railroad session, Friday morning: "Clasp Brakes for Heavy-Passenger-Equipment Cars," by T. L. Burton, New York Central Railroad Co., New York; "Mechanical Design of Electric Locomotives," by A. F. Batchelder, engineer, General Electric Co., Schenectady, N. Y.; and "Pulverized Fuel for Locomotives," by J. E. Muhlfeld, New York.

The adjournment of the meeting on Friday was succeeded by a public hearing by the boiler code committee which lasted till nearly midnight on Friday and extended throughout all of Saturday. All of the provisions of the society's model boiler code were thrown open to discussion but changes were suggested with respect to comparatively few of them. One important feature of the hearing was the recommendation by a large number of welding experts that the code be revised to permit the use of the oxy-acetylene flame or the electric arc in welding boiler joints. It was claimed that the art of welding by autogenous methods has been developed to such a high degree that satisfactory welds now can be made without the use of rivets, and it was stated that boilers which have been welded for test purposes are proving entirely satisfactory. A section of the code which called forth considerable discussion is that covering the specifications for steel boiler plates and tubes. A number of representatives of the manufacturers wanted a revision of the section which limits the copper content of the steel to 0.05 per cent; some speakers advocated that the limit be removed altogether, while others recommended increasing the limit to 0.3 per cent. It was stated that the iron ores generally used would make it easily possible to produce steel not exceeding 0.3 per cent in copper, and the concensus of opinion appeared to be that such steel safely could be used. The recommendations made at the hearing will receive attention at a series of private meetings to be held by the boiler code committee in January.

A meeting called by the industrial commission of the state of Ohio, and attended by representatives of the industrial and boiler departments of 29 other states, as well as similar representatives from a number of Canadian provinces, was held in Washington, Dec. 4 and 5, for the discussion of prevailing boiler laws. The discussions were concentrated chiefly on the necessity for uniform boiler laws throughout the country and the concensus of opinion was that the adoption of the model boiler code formulated by the American Society of Mechanical Engineers is advisable in all the states which have not already revised their boiler laws to bring them in harmony with this code. The attendance of the Canadian representatives, and the favorable opinion they expressed with respect to the A. S. M. E. code, is expected to result in its adoption in Canada.

Among the numerous social affairs in connection with the meeting were the annual reunion and dance held Thursday evening; ladies' reception and tea, Wednesday afternoon; a smoker, Wednesday evening; and college reunions Friday evening. Many members and guests of the society participated in the excursions to various buildings and plants throughout the city. The following places were visited: Telephone building, Walker street; Equitable building, 120 Broadway; the machine shop of the Otis Elevator Co., Yonkers; Essex plant of the Public Service Co., of New Jersey; steam plant of the New York Steam Co.; and the Brooklyn navy yard.

A Pioneer of the Wire Industry

Gary G. Calkins died at his home in Evanston, Ill., at the age of 70 years, November 30, of acute pneumonia. His passing brings back an interesting history in relation to the beginning of a great industry.

Mr. Calkins, associated with his two brothers, now dead, in the Thorn Wire Hedge Co. was the first to manufacture barbed wire in the form universally used today. They owned one of two patents controling the manufacture of barbed wire up to 1898 at which time the patents expired. Their patent was based on the broad claim of a barb applied to two wires, twisted to prevent sliding. The other patent owned by Joseph Glidden and Isaac Ellwood of De Kalb, Ill., was based on the claim of a barb or wooden spool pierced with barbs, strung on a single wire and fastened by the wire, being waved on each side of the spool to prevent sliding. Up to that time, wood had been used for fencing cattle.

In 1889, the Washburne-Moen Co., of Worcester, Mass., which was drawing plain wire, became interested in the possibilities of barbed wire for fencing and made a contract with Mr. Calkins and his associates in the Thorn Wire Hedge Co. to take over their patent, paying a royalty on every pound of barbed wire produced by them or anyone they might license, giving the Thorn Wire Hedge Co. a free license to manufacture in Chicago. A similar arrangement was made with Glidden and Ellwood, at De Kalb, thus securing the United States right under these patents until their expiration, a period of nine years. The farmers were slow to adopt the use of barbed wire for fear of injury to cattle, but it gradually became popular. Other companies then began manufacturing different shaped barbs and 30 or more companies in Illinois, Missouri and Indiana, including the Gates plant of St. Louis were found to be infringing on the two base patents. The Washburne-Moen Co. instituted suits, recovering back royalties and licensing these several companies to manufacture under royalty to them, apportioning to each certain tonnages.

John W. Gates, one of these, saw the necessity of a stronger organization and formed a combination of many of them with the Washburn-Moen Co., which later became the American Steel & Wire Co. of New Jersey. The Washburn plant at Worcester, Mass., is now the Central works of this Corporation.

Charles H. Hersey, president of the Hersey Mfg. Co., maker of special machinery, 314 West Second street, South Boston, Mass., died at his home in the Roxbury district, Boston, Dec. 9. He was a widely known inventor.

Albert I. Bailey, founder and president of the Champion Bridge Co., Wilmington, O., died Nov. 23, aged 70 years.

Alfred Van Fleet, president of the Van Fleet Mfg. Co., Joliet, Ill., died Dec. 8 at Seattle, Wash., aged 74 years. His death was caused by injuries received Thanksgiving day in an automobile accident.

Frederick C. Fisher president of Ferro Construction Co., died Dec. 6 at the Washington Park Hospital, Chicago, after an operation for appendicitis. He was 45 years of age, and a graduate in engineering of the University of Michigan.

George Austin Morrison, treasurer of the Metals Trading Corporation, 99 John street, New York, died Nov. 29 while attending a dance at Sherry's.

A. M. Dolph, founder of the American Laundry Machinery Co., Cincinnati, died Nov. 29 at his residence in Mt. Auburn, that city. Mr. Dolph was one of the best known business men in Cincinnati.

John H. Clemens, aged 80 years, died Dec. 4 at his home in Pittsburgh. Many years ago, he was connected with the Sligo Iron & Steel Co. and the Oliver Iron & Steel Co. He designed and developed one of the first water flue puddling furnaces used in the Pittsburgh district.

William H. Scranton, who in 1881 organized the Scranton Steel Co. which he subsequently sold to the Lackawanna Steel Co., died suddenly at Scranton, Pa., Dec. 3, aged 73 years. Mr. Scranton was one of the pioneers in the introduction of the bessemer process of steelmaking in the United States. The Scranton Steel Co. is said to have been the first in this country to roll 120-foot steel rails direct from the ingot. Mr. Scranton started his iron and steel career as an employe in the puddling mill of the Scranton Iron & Coal Co. at Scranton, and later became a proprietor. The city of Scranton has taken its name from his family.

Another important enlargement of the shops of the Baldwin Locomotive Works at Eddystone, Pa., is in contemplation and construction bids now are being taken. The new building will consist of four bays, each, 50 feet wide, and of different lengths, such as 145, 240, 295 and 310 feet, respectively.

The Standard Die & Tool Machine Co., of Toledo, has applied for permission to increase its capital stock from $10,000 to $35,000. D. J. McKinnan, president of the concern, reports business steadily increasing.

Factory Property Sold

Chicago, Dec. 9.—The Allis-Chalmers Mfg. Co., Milwaukee, has sold another piece of its Chicago real estate, the Hanna Engineering Co. taking a part of the tract. The property is known as the old Gates Iron Works. Philetus W. Gates, founder of the Gates Iron Works, who built the factory buildings now on the land, is president of the Hanna Engineering Co. which now takes over the plant. Its output is special machinery and tools. The remainder of the property will be used by John Miller & Co. and the Chicago Tanning Co., each buying a part.

New Tube Mill

Detroit, Dec. 11.—The International Steel Tube & Rolling Mills, Inc., capitalized at $2,500,000, will commence the erection of a 50-ton tube mill at Ecorse, within 60 days. The first tube mill will be in operation early in the spring. H. K. Flagler, president and general manager of the company, has operated mills in Boston, Syracuse, Buffalo and McKeesport. The company will make lap-welded tubes for steam boilers and the bulk of its output will go to builders of locomotives and marine boilers.

New Power Plant

The Toledo Railways & Light Co., of this city, will erect a new power plant on the site of the old Republic Iron & Steel Co.'s plant in the near future. The plant will have an initial capacity for 120,000 kilowatts and the floor space has been arranged so that it can be raised to 200,000 kilowatts, without any reconstruction being necessary. A contract for two motors of 27,000 kilowatts has been placed with the General Electric Co. The contracts for the remainder of the equipment have not been placed.

Plans for New Warehouse

The erection of a new storage and warehouse building is being contemplated by the General Cartage & Storage Co., Cleveland. The structure, which is to be 6 stories, 62 x 290 feet, brick and reinforced concrete, is to be located on Euclid avenue, corner East Sixty-sixth street. Plans have been submitted by the Grieble Eng. Co., Cleveland.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., has received an order from the United States government for 75,000 pistols at $15 each, a total of $1,125,000. They are of the army automatic type.

Iron and Money: Fact and Comment

Foreign Demand for Steel Will Broaden Still Further as Result of Recent Momentous European Developments— Steel Stocks Almost at Standstill

STEEL, and still more steel! This foreign cry will swell to even more resounding tones as the result of recent European developments of deep significance. The Teutonic legions are overrunning Rumania, capturing its fertile fields and precious oil wells—a victory second in importance only to the battle of the Marne in this war. The sequel to this momentous victory is revealed in the universal decision among the entente allies to prosecute the war more vigorously than ever to bring it to a decisive and favorable conclusion. Political housecleanings have taken place in Great Britain and Russia; in France there is to be a new organization of the general staff and a concentration of the war's conduct under restricted direction; Italy's premier reiterates to the chamber of deputies that country's unshakable determination to maintain the war.

The new policy which is growing out of the allies' decision to quicken their military activity is expressed in the words "organization", "concentration" and "restricted direction", which indicate a further making over of the various nation resources, particularly in Great Britain, to the business of war. England practically has vested supreme power in David Lloyd-George, her energetic man of the hour. The fall of Rumania and its resources minimizes the British naval blockade of Germany as a factor in crushing the Teutons economically. The allies' chief hope now seems to lie in the overwhelming of Germany by sheer weight of steel, by an offensive which will make Verdun and the Somme seem child's play.

The net result of this policy is the creation of a broader demand for munitions and to America the allies must turn for the necessary raw materials. Great Britain has been spending $25,000,000 a day for the war, of which $10,000,000 has gone to the United States. The mere matter of paying this big bill is not even a question, for England's credit is indisputable; but the ways and means of settling for her supplies have caused some conjecture among bankers. Hence we have seen the British treasury bill fiasco brought about by the federal reserve board's warning to banks against accepting this paper. This episode was the direct cause of the early December flurry in the money market, when call rates rose to 15 per cent. The British government was forced to utilize all the securities it could command in the New York call loan market, following the famous warning, and the sudden borrowing of $30,000,000 left Wall Street without its day-to-day means of doing business.

The movement in the money market, being immediate and outstanding in its technical effect on the stock market, has obscured the relation of the foreign affairs to domestic business. Steel stocks have practically stood still the past week, notwithstanding constantly increasing prices for steel and prospects of a prolongation of demand for material. The United States Steel Corporation reports the record increase of over 1,000,000 tons in its unfilled tonnage during November, but Steel common declined almost two points last week. Quotations on a number of iron and steel and industrial stocks at the close of the New York stock exchange Dec. 9 and net changes for the preceding week are shown in the following table:

	Close Dec. 9.	Net chg.
American Can	61¾	—1⅞
American Can, prfd.	114½	.....
Amer. Car & Fdy.	76⅛	+1⅛
Amer. Car & Fdy., prfd.	119	+1
American Locomotive	92	+1
American Locomotive, prfd.	107⅛	—1⅛
American Steel Foundries	70⅝	+2⅞
Baldwin Locomotive	80½	+3⅜
Baldwin Locomotive, prfd.	104½	—1¾
Bethlehem Steel	644	+24
Bethlehem Steel, prfd.	160	.....
Colorado Fuel & Iron	55¼	—2½
Continental Can	99	—1
Continental Can, prfd.	113	—1
Crucible Steel	85¼	+1¼
Crucible Steel, prfd.	121	—1¼
General Electric	179	—1
Gulf States Steel	160	—13
Gulf States Steel, 1st prfd.	109	—4
Internat'l Harv. of N. J.	124½	+ ½
Inter. Harv. of N. J., prfd.	121¾	+1¾
Internat'l Harv. Corp.	80	—4½
Internat'l Harv. Corp., prfd.	114⅛	+2⅛
Lackawanna Steel	104	+ ¼
Nat'l Enamel'g & Stmp. Co.	35½	+2½
Nat'l En. & Stmp. Co., prf.	100	+ ⅛
Pressed Steel Car	82⅛	—1⅝
Pressed Steel Car, prfd.	106⅞	— ½
Pullman Palace Car	165	—1
Republic Iron & Steel	87⅜	—1⅜
Republic Iron & Steel, prf.	115½	— ⅛
U. S. C. I. Pipe & Fdy. Co.	26	+ ½
U. S. C. I. P. & F. Co., pr.	65	+1
United States Steel	124¾	—1⅛
United States Steel, prfd.	121¾	+ ⅛
Westinghouse Mfg.	61	—2½

Maximum quotations for a number of leading iron and steel securities not listed on the New York stock exchange as of Dec. 8 and Dec. 1, compare as follows:

	Dec. 8.	Dec. 1.
American Radiator	420	425
American Ship Building	68	67
Cambria Steel	130	134¾
Chicago Pneumatic Tool	75½	76½
LaBelle Iron Works	90½	94
Lake Superior Corp'n	31	32½
Stewart-Warner Speed. Co.	113½	106½
Warwick Iron & Steel	9¾	9¾
Westinghouse Air Brake	166½	166
Westingh'se Elec. & Mfg. Co.	64	64⅞

Schwab to Buy Plants?

An offer of purchase has been made by Chas. M. Schwab in behalf of the Bethlehem Steel Corporation for the plants of the American Iron & Steel Mfg. Co., located at Lebanon and Reading, Pa. Stockholders of the company have been asked to sign options for the sale of their shares. The price tendered by the prospective buyer has not been disclosed officially, but it is understood to be the amount of the capital stock of the company or $5,550,000, which consists of $2,550,000 of common and $3,000,000 of 5 per cent cumulative preferred. It is known that the American Iron & Steel Mfg. Co. several months ago gave an option at a similar figure to parties other than the Bethlehem Steel Corporation. The American Iron & Steel Mfg. Co. has been one of the leading eastern manufacturers of bar iron, nuts, bolts, spikes, rivets and similar smaller lines. It operates well-equipped plants at Lebanon and Reading, consisting in all of 33 double puddling, and 24 heating furnaces, billet, muck and numerous merchant mills. In recent years, it has installed four 50-ton open-hearth furnaces and two 20-ton Frick electric furnaces. Jas. Lord is president and John P. Brock, vice president. If the sale is consummated, it is expected that the Bethlehem Corporation will abandon plans for the erection of a large nut, bolt and spike works at South Bethlehem, Pa.

Laconia Car Sales

The Laconia Car Co., Boston, has made public its statement of condition as of Sept. 30, the close of its fiscal year. Cash on hand amounted to $39,599, compared with $80,043 a year before and $62,453 two years before. President C. S. Hawley states that the New England railroads ordered only a few cars during the year, but large orders were placed by electric railways, of which the Laconia company received its share. A large part of the company's orders for electric car bodies and trucks were received the latter part of the year and the profits will not show until next year. Of the 250,000 high explosive shells on the Laconia Car Co.'s books, 125,000 were shipped

prior to Sept. 30. In view of the small shipment of cars the directors deferred payment of preferred dividends. Craig Colgate has resigned from the directorate. No new president has been chosen to succeed Mr. Hawley, who is resigning to become treasurer of the Remington Arms Co. The following have been added to the board: C. C. Jamieson, A. Tenney White, H. Denton White and C. C. Barton Jr.

Harbison-Walker Profits High

The Harbison-Walker Refractories Co., Pittsburgh, has issued its fourteenth annual report for the fiscal year ending Sept. 30, 1916. The statement shows net profits available for dividends amounting to $3,540,604, compared with $1,498,889 the previous fiscal year. The surplus available for common dividends was $2,964,604, equivalent to 16.47 per cent on the $18,000,000 common stock, compared with $922,889 or 5.12 per cent on the same stock the previous year. In the year ended Sept. 30, 1914, the company showed a net surplus of $548,988 available for common dividends, equivalent to 3.05 per cent. During the last fiscal year the Harbison-Walker company declared the regular dividend of 6 per cent on the preferred stock; regular dividends of 5 per cent on the common and an extra dividend of 2 per cent on the common. The company has had no interest charges to pay for the past three years. President H. W. Croft issues this note of warning:

"While our earnings for the year ending Sept. 30 are gratifying to the officers of the company, they do not fail to take note of the fact that conditions have been abnormal."

The income accounts for the past two years compare as follows:

	Yr. end'g 1916.	Sept. 30: 1915.
*Earnings	$4,305,450	$1,673,790
†Sundry deduct	764,846	174,902
Net profit	$3,540,604	$1,498,889
Prfd. div.	576,000	576,000
Surplus	$2,964,604	$922,889
Com. div.	900,000	360,000
Surplus	$2,064,604	$562,889
Com. div. (extra)	360,000	.....
Surplus	$1,704,604	$562,889
Prev. surp.	6,842,653	6,279,765
Total surp.	$8,547,257	$6,842,653

*After charging off $685,783 in 1916 and $286,330 in 1915 for all ordinary repairs and maintenance which covers depreciation of plants.

†Deductions for extensions to works, for depreciation of mining and train outfits and for depletion of clay, coal and ganister properties.

Financial Crop Ends

The Rich Twist Drill Co., of Battle Creek, has reorganized and incorporated under the laws of Michigan, the capital stock having been increased from $25,000 to $100,000 and the name changed to the Rich Steel Products Co. The firm has occupied a new plant and will increase its number of employes for more extensive operations.

* * *

The combined profit statement of the Driggs-Seabury Ordnance Co. and the Savage Arms Co. for the 10 months ended Oct. 31 follows: Sales, $6,203,925; operating expenses, $3,357,629; manufacturing profit, $2,846,296; other income, $121,612; gross profit, $2,967,908; administration and other expense, $907,068; bond interest, $75,000; net profit, $1,986,843. President A. E. Borie says:

"Our deliveries of all kinds have materially increased, deliveries of Lewis machine guns in October having been 40 per cent greater under British inspection than the total deliveries of these guns for the three months ending Sept. 30. We expect to maintain our present rate of delivery."

* * *

Another Pacific coast ship building company has been organized, financed partly by New York capital. The company will be known as the Todd Ship Building & Dry Dock Co. and will have a yard at Tacoma, Wash. It will be headed by William H. Todd, who is president of the Todd Ship Yards Corporation of New York. The company already has extensive holdings on the Pacific coast, including the Seattle Construction & Dry Dock Co. It also owns the Erie Basin Dry Dock Co., Brooklyn, and the Tietjen & Lang Dry Dock Co., Hoboken. The company was formed in June, 1916, also acquiring the Robins Dry Dock & Repair Co., the largest ship repair company in New York harbor.

* * *

The Gilliam Mfg. Co., Canton, O., has changed its name to the Gilliam Co., and is increasing its capital stock from $350,000 to $800,000. The plant of the John Danner Mfg. Co. has been purchased and a modern foundry will be built. New capital has been brought into the Gilliam company by men formerly officers of the Novelty Iron Co., which moved from Canton about a year ago, at which time its officers resigned. These officers include Huntlie Gordon, who was president of the Novelty Iron Co.; Charles M. Converse, who was treasurer and sales manager, and B. T. Steiner, also an officer.

Pig Exports Heavy

The heavy exporting of pig iron is beginning to be revealed in the government reports of foreign commerce, as compiled by the bureau of foreign and domestic commerce. The pig iron tonnage exported in September was 60,264, and in October, 101,756, compared with only 21,212 in October, 1915. The total exports reported on a tonnage basis for October amounted to 610,110, the largest tonnage of the year except for September.

The value of exports of iron and steel and the manufactures thereof for October fell slightly below those for September, the October amount being $82,010,972, compared with $90,895,592 in September and $43,299,457 in October, 1915. Imports in October, 1916, amounted to $2,429,595, compared with $2,859,787 in September and $1,857,709 in October, 1915.

There was a decided decrease in the imports of manganese ore, the total tonnage for October being only 26,078, while in September, 73,536 tons were imported. Ferro-manganese imports also show a slight decrease, the tonnage being 8,114 in October, compared with 9,787 in September.

IMPORTS AND EXPORTS.

1915.	Imports, gross tons.	Exports, gross tons.
July	20,858	378,890
August	27,556	405,850
September	23,345	381,914
October	34,730	351,039
November	37,131	362,764
December	35,456	353,836
1916.		
January	15,824	354,416
February	20,279	368,869
March	26,212	438,054
April	20,176	384,917
May	32,114	540,580
June	26,786	526,759
July	14,729	503,187
August	32,257	597,739
September	25,559	643,762
October	30,169	610,110

IRON AND STEEL IMPORTS, GROSS TONS.

	October, 1916.	October, 1915.	Ten months end'g October, 1916.	Ten months end'g October, 1915.
Scrap	11,748	10,517	59,520	40,435
Pig iron	14,829	8,343	112,625	69,234
Ingots, blooms & billets of steel.	2,481	946	22,253	10,217
Wire rods	183	407	3,467	4,278
Rails	493	13,294	24,931	73,940
Bar iron	220	640	6,965	7,235
Structural	32	40	1,113	1,242
Sheets & plates	73	116	1,384	1,040
Tin & terne plte.	110	15	936	2,235
Total	30,169	34,318	233,194	209,856

IRON AND STEEL EXPORTS, GROSS TONS.

	October, 1916.	October, 1915.	Ten months ending October, 1916.	Ten months ending October, 1915.
Scrap	19,994	17,715	178,346	58,098
Pig iron	101,756	21,212	404,260	178,151
Billets, ingots and blooms of steel	162,679	43,429	1,220,788	451,242
Wire rods	13,927	13,647	132,414	135,194
Steel rails	52,753	66,969	444,202	292,265
Steel bars	64,131	40,989	653,330	337,320
Iron bars	4,512	3,384	63,688	29,984
Struc. iron & steel	25,342	23,361	237,211	188,445
Hoops, band and scroll.	3,369	3,230	36,621	22,267
Sh'ts & pl'tes	48,923	35,775	419,880	355,819
Tin and terne plate	14,195	17,018	193,318	122,129
Barb wire	37,615	19,910	379,526	192,794
All oth. wire	18,512	16,872	230,519	184,936
Cut nails	541	392	4,204	3,532
Wire nails	13,202	8,143	127,911	74,719
All oth. nails incl. tacks.	1,558	1,032	9,282	7,201
Pipes & fit'gs	22,681	10,851	183,847	139,906
R. R. spikes.	1,032	2,375	21,172	7,191
Bolts, nuts, rivets and washers	2,919	2,747	24,841	18,333
Horseshoes	222	597	7,251	14,568
Cast-radiators	247	195	2,106	1,848
Total	610,110	349,843	4,974,717	2,815,942

News of Employers and Employes

Cooperation of Capital and Labor Discussed by President Outerbridge of the New York Chamber of Commerce—Dayton Strike Virtually Ended

THE problems of co-operation between capital and labor were discussed recently by Eugene H. Outerbridge, president of the New York chamber of commerce, at the dinner of the state chamber of commerce at the Waldorf. He spoke also of another problem, that of meeting the superior efficiency of foreign producers after the war.

"In the world conditions now prevailing the peoples of the belligerent nations have, under the stress of a compelling necessity, developed a degree of co-operation and efficiency in production of which they never before knew themselves capable, and which has never been approached anywhere else in the world.

"The war has produced many unprecedented conditions. This is only one of them. After it is over there will be many we shall have to meet and many changes to which we shall have to adapt ourselves; some cannot be foretold or foreseen; but it appears to me inevitable that the consciousness of efficiency and productive power that has been devoted in the European peoples will lead them not to return to previous methods or lives of indolence or ease, but that they will return their newly developed powers to production in peaceful pursuits, and that we then shall have to meet in foreign fields and perhaps in domestic trade the force of a competitive production organized upon a degree of efficiency which we have never before had to combat.

"If I am right, under the conditions that will then prevail the relations between capital and labor in this country will become of still greater moment to us than ever before. I think there is no single element in industry before this country today of such vast importance as the matter of bringing these two constituents into mutual confidence and understanding in a real spirit of co-operation.

"The peaceful progress of industry free from strikes or lockouts is essential to economic results. In all great public services where the public interest exceeds that of employers or employes some method must be found preventive of interruptions of service, which are wasteful and costly often beyond computation; methods which will enable the public to be currently, adequately, and correctly informed in order that public opinion, usually the determining force, may be well founded.

"No greater service could at this time be rendered than to find some system by which industrial disputes may be avoided or adjusted before they reach the crisis of a struggle which dislocates industry, causes employers and employes untold loss, and injures the public's welfare. I trust that this is a subject to which some committee of the chamber of commerce may especially devote itself during the coming year."

Declared Off

The strike of the Morgan Spring Co., Worcester, Mass., declared more than a year ago, has been called off by the machinists' union of that city. It never seriously affected the company and it is employing more men than before the strike. This action on the part of the union leaves but one shop in Worcester where it claims a strike exists, that being the Leland-Gifford Co., but to all intents and purposes nothing of the kind appears in evidence. These strikes were called in September, 1915, and affected about 3,000 machinists, most of whom are working in other shops in Worcester and elsewhere.

Dayton Strike Ended

The machinists' strike at Dayton, O., is virtually ended, and, although not officially called off, its leaders, organizers of the machinists' union, have left town, leaving behind them the following observations:

"While we have not been as successful as we had hoped, still we have succeeded in badly crippling a number of the shops involved and will not relax our efforts until the eight-hour day is firmly established."

Sixty manufacturing companies, employing more than 20,000 machinists, were involved. According to A. C. Marshall, secretary of the Dayton Employers' Association, only 22 machinists were present at the last meeting before the organizers left town. Robert Fechner, an organizer, is quoted as saying: "We have made a failure of it and the Grand Lodge will send a new man."

"The potential factor in defeating this attempt of labor leaders to 'capture' Dayton was the workmen themselves," says Mr. Marshall. "Dayton's machinists rank high in intelligence, industry, thrift and all the characteristics of good citizenship. They saw this was a 'harvest time' for Dayton labor and they had the prudence and wisdom to assist in gathering it.

"Conditions are normal. None but highly skilled workmen are being employed and these are always in demand in Dayton, and on terms and conditions that are attractive to this class of artisans.

"We are in receipt of many inquiries, in substance: 'How did you do it?' A terse and concrete reply is: 'The failure of the strike was a logical result of observance of the motto of the Dayton Employers' Association, viz.: 'Do right; then, if necessary, fight to a finish.' This guarantees an open shop town and insures industrial peace."

Wage Increases

The Fore River Ship Building Corporation, Quincy, Mass., has given its 2,400 employes below the grades of foremen and assistant foremen, an increase of 10 per cent in wages, which started Dec. 4. President Joseph W. Powell states that the increase is given in recognition of the increased cost of living. It will add $350,000 to the annual payroll.

The Chicago Bridge & Iron Works has given its employes a 10 per cent increase in wages, effective Dec. 1. This includes all its employes at its plants at Chicago, Greenville, Pa., and Bridgeburg, Ont., as well as the field and erecting forces. The increase means an addition of $100,000 annually to the payroll.

The Gillette Safety Razor Co., Boston, has made another 10 per cent increase in the wages of all its employes, to date from Oct. 1, 1916. It is the second for the same amount made by the company this year.

The Graton & Knight Mfg. Co., Worcester, Mass., has given its 1,800 employes a 10 per cent flat increase in wages. A similar increase was given last May.

The United States Envelope Co., whose headquarters are in Springfield, Mass., has given the 2,500 employes in its 12 plants in the United States an "emergency bonus" of 10 per cent payable Dec. 15, and on the fifteenth of each following month until further notice, and also an additional bonus of 2½ per cent to those employes who have lost no time during the

month. The increase is made because of the abnormal increases in cost of living.

The American Wringer Co., Woonsocket, R. I., has increased the wages of its 500 employes 10 per cent.

George W. Prentiss & Co., wire manufacturers, Holyoke, Mass., have given their 700 employes a 5 per cent wage bonus.

The Ames Shovel & Tool Co., North Easton, Mass., has again increased the pay of its employes, the amount varying with the different departments. During the past few months some of the departments have received increases amounting to as much as 30 per cent.

The North & Judd Mfg. Co., New Britain, Conn., has given its employes a 5 per cent bonus to be paid every two weeks. It is stipulated that only those who lose no time will benefit. Thus, if an employe loses half an hour, he will receive no bonus on the date of the next payment, even if he works every hour from that time on. The purpose of the bonus is to stimulate employes to steady work, thereby increasing the output.

The Gilbert & Bennett Mfg. Co., wire goods, Georgetown, Conn., has given its 500 employes a wage increase because of the high cost of living and the growing difficulty of the workingman to meet prices demanded for necessaries. Those earning $2.50 a day will get 50 cents a day more; those who earn more than $2.50 up to $4 will receive a 10 per cent increase; those earning more than $4 a 6 per cent increase and all boys and girls 25 cents a day more each. Piece workers' wages will be advanced generally 10 per cent.

The General Electric Co. is reported to plan increasing the wages 15 per cent of the 6,000 employes of its Pittsfield, Mass., works on Jan. 1.

More than 700 laborers employed at the two plants of the H. B. Smith Co., maker of boilers and radiators, Westfield, Mass., have been granted a wage increase of 25 cents a day, amounting to more than 10 per cent.

Employes of the Spencer Wire Co., Spencer, Mass., have been given an increase in wages varying from 2 to 5 per cent, which the company classes as an adjustment.

Eastern iron and steel companies are joining in the recent general movement to grant an additional 10 per cent increase in wages to employes. The Bethlehem Steel Corporation has posted a notice to this effect applying to its several plants, effective Dec. 16. The Central Iron & Steel Co., Harrisburg, has made a similar announcement, effective Dec. 16.

Large Car Shops

To be Located in Cleveland—Site Already Purchased.

Cleveland will have a new car manufacturing plant in the near future. The Steel Car Co., recently incorporated for $500,000, has purchased from Frank B. Carpenter, general counsel for the Nickel Plate railroad, about 30 acres between Bliss road and Chardon road to be used as a site. The plant will have an approximate total of two miles of sidings and branch sidings to be served from the Nickel Plate and New York Central railroads. These are being laid at the present time. The erection of a group of manufacturing buildings will be started immediately, the first of which will cover a ground space of 60 x 200 feet. This is to be a wooden mill of mill construction. Machine shop and forge shops of brick and reinforced concrete construction will follow. Duchon Bros. have been awarded the contract for the wooden mill, in which machinery costing approximately $30,000 is to be installed and has already been contracted for. The company will devote its entire facilities to the repair department for the first year or two. Old and battered cars too weak for active service will be reinforced with steel underframes and new bodies, if necessary. When the repair department is established on a firm basis, manufacturing buildings will be erected.

P. H. Joyce will be president of the new company. He holds the same office in the Illinois Car & Mfg. Co., and the Indiana Car Mfg. Co., both located in Chicago. J. F. Farrell, likewise associated with the two above named concerns, will be vice president. Other officials include N. J. Clarke, of the Upson Nut Co., treasurer, and Richard Inglis, of Bulkley, Hauxhurst, Inglis & Saeger, attorneys in the Cuyahoga building, Cleveland, secretary.

May Sell Plant

A move to economize and increase the efficiency by concentrating the entire production in one plant is believed to be behind a call for a meeting of the stockholders of the Hendee Mfg. Co., in Springfield, Mass., on Dec. 15, when they will be asked to authorize the sale of the East Springfield plant and the real estate adjoining, now occupied by the foundry of the Harley Co. A company which will engage in the manufacture of wire wheels is being formed to take over the East Springfield plant at a price said to be $1,000,000, while another company is being formed to buy the Harley Co. plant for $500,000. Both will be controled by the same interests which control the Hendee Co. and stock will represent the purchase prices, rather than cash. The Hendee Co. will confine its manufacturing to the Winchester square plant in Springfield, where the foundry work will be done.

Motor Car Company Expands

Plans for several additions to be made to the Jordan Motor Car Co., Cleveland, have been drawn up by the Burchard, Roberts, Wales Co., Cleveland. The building employed at the present time will be used, upon the erection of the new plant additions, for chassis assembling and painting. The largest of the new buildings, a reinforced concrete and brick structure, 100 x 300 feet, will be used for the finally assembly of cars. Other additions include a japanning department, 60 x 100 feet, a boiler house, 30 x 40 feet, and a motor test building, 15 x 50 feet, all 1 story. No contracts have yet been let.

Three New Buildings

The Burchard, Roberts, Wales Co., Cleveland, has prepared plans for three buildings to be erected by the Lamson-Sessions Co., Cleveland. The contracts for a 35 x 160-foot storage building and a 40 x 60-foot addition to the present plant have been let to the Boldt-Lo Construction Co., Cleveland. The third building, of sawtooth roof construction, is 80 x 120 feet. The contract for this structure is pending. The total steel tonnage in the three buildings, which is being furnished by the Forest City Steel & Iron Co., is approximately 200 tons. A new monorail system will also be installed in the plant.

Gas Engines Sold

The C. & G. Cooper Co., Mt. Vernon, O., has recently taken orders for a number of large gas engines, including the following:

Two 480 brake horsepower single tandem engines to the American Zinc, Lead & Smelting Co. for installation at Caney, Kas.; one 960 brake horsepower twin tandem to the B. B. Stroud Co., Bradford, Pa.; one 560 brake horsepower single tandem to the Charles Boldt Co., Huntington, W. Va.; three 480 brake horsepower single tandems to the Columbia Gas & Electric Co., Cincinnati; two 960 brake horsepower twin tandems to the United Fuel Gas Co., Charleston, W. Va.; one 1,150 brake horsepower twin tandem to the National Carbon Co. for installation in its Clarksburg, W. Va., plant; one 150 brake horsepower duplex engine to the Moores & Ross Milk Co., Columbus, O., for direct driving ammonia compressor cylinders. The company has just placed in operation two 480 brake horsepower engines in the compressor station of the Berea Pipe Line Co., Berea, O.

Not Striking Down Big Business

Says Circuit Court at Detroit Which Extends Injunction Against Henry Ford for Sixty Days—Probable That Building of Large Plant Will Be Delayed for a Long Time

Detroit, Dec. 11.—Basing their assertions upon the fact that Henry Ford's capital of $50,000,000 is in violation of the state law which prohibits a capitalization of more than $25,000,000, John F. and Horace E. Dodge, comprising the firm of Dodge Bros., motor car manufacturers, have obtained an extension for 60 days of the injunction against Henry Ford restraining him from erecting his $20,000,000 blast furnaces and steel plant on River Rouge. The Ford contention is that the state law applies only to capital stock and the capital stock of the Ford company is $2,000,000.

By their decision, Circuit Judges Wiest, Hart and Chester infer that there is doubt whether the Ford directors have a right to build the proposed plant. While this is a partial victory for Dodge Bros., the Ford interests are also favored to the extent that the burden of proof to show whether Ford has a right to build the plant now rests with the Dodges. At best, months of litigation must follow and one of the biggest proposed projects in the middle west, of its kind, is effectually blocked.

The court also held that Henry Ford was not unfairly dominating his stockholders and he now has permission to go ahead with his improvements to the Ford main plant in Highland Park, where huge additions are being made to the original plant.

In rendering their opinions, the judges recommended that final hearings of the case be postponed no longer than 60 days. Alfred Lucking, counsel for Henry Ford, will demand that the case be tried at once on its merits. Both sides are determined to carry the case to the highest court in the United States. The court's ruling in part follows:

"It is hardly necessary to go beyond a reading of the statute itself (the state law forbidding corporations capitalized at more than $25,000,000) to discover that the legislature had a clear understanding between capital stock and capital. The capital stock of the defendant is within the limitations fixed by law. It has been suggested that the Ford Motor Co. should be kept from perfecting and extending its activities as to be above competition.

"We find no power vested in this court to strike down big business until the legislature sees fit to declare the public policy with respect to big business a question as an open political one and not judicial. To warrant a court in directing a dividend, it must appear that there is bad faith, willful neglect or abuse of discretion on the part of the directors.

"The directors may not employ the accumulated cash profits from any expansion of business, without having in mind the financial benefit of the stockholders." This remark may have been aimed at Mr. Ford's expenditure of company's funds for philanthropic work among its employes.

Continuing, the ruling says: "If the purpose of spending $20,000,000 to build a smelter is to prevent the stockholders from having their just division of profits, the court will protect the rights of stockholders. The directors represent a fiduciary relation to the stockholders and they must not forget that the best interests of the stockholders must be their guiding principle, and that inasmuch as business corporations are conducted for profit, they must not bend their energies in other directions."

Judge Guy M. Chester dissented from the section of the claim by the defendant that he had a right to smelt ore for his own uses, when such operations were planned to be carried on with the magnitude intended at the River Rouge furnace.

This ruling does not affect the erection of the big tractor plant planned for the River Rouge. This project is to be consummated by Henry Ford and his son, Edsel, and has no connection with the Ford Motor Co.

The Dodge brothers in bringing the suit had asked circuit court to forbid the Ford Co. from using the $53,000,000 surplus of the company to carry out Henry Ford's plan of extension. The Dodges asked the distribution among the stockholders of $36,000,000 of the surplus.

While the Ford-Dodge controversy is of international interest, iron and steel industries of the middle west are particularly interested in the River Rouge improvements. When the Ford smelter proposition first became public, a dozen industries located along the Rouge were hoping for a consummation and through their efforts the government was induced to investigate the advisability of improving the Rouge so that it would be navigable for boats of larger draft.

Major H. Burgess, United States corps of engineers stationed in Detroit, made a survey of the Rouge and submitted to the government an estimate of the cost of deepening and widening the river, which now is but 16 feet deep, this depth having been attained by government dredging. Should the government make Detroit a port of call for lake vessels by the improvement of the Rouge, a great steel industrial center for Detroit is seen. There is still enough vacant property along the Rouge for the establishment of other industrial plants and many have been located there for years, depending upon railroad transportation to a large extent.

While the fate of the Ford River Rouge plant is somewhat in doubt, contracts for the erection of two Ford blast furnaces have been let to the Riter-Conley Co. The 20,000 tons of steel required for the erection of furnaces and steel mills will be furnished by the American Bridge Co. The Ford Motor Co. is now taking the entire production of the United Steel Alloy Corporation, of Canton, for its motor production of 2,400 cars daily.

Will Meet in Cincinnati in May

Charles E. Hildreth, president of the Whitcomb-Blaisdell Machine Tool Co., and Albert E. Newton, vice president and general manager of the Reed-Prentice Co., both of Worcester, Mass., who are general manager and treasurer, respectively, of the National Machine Tool Builders' Association, were in Cincinnati, last week, and made preliminary arrangements for the holding of the semi-annual convention of the organization in Hotel Sinton, that city, on May 21 and 22. The details were left in the hands of the Cincinnati members. The convention will be the first in Cincinnati since April, 1904, and elaborate arrangements will be made for the entertainment of the delegates.

The Diamond Coal & Coke Co., Pittsburgh, has leased for a period of three years 350 acres of coal land from the Snowden Coal Co., Brownsville, Pa.

Business News of Nation's Capital

Secretary Baker Speaks of the New Relations of Business and Government—Dr. Pratt Discusses Commerce During and After the Great War

Bureau of *The Iron Trade Review*,
206 Corcoran Building,
Washington, Dec. 12, 1916.

DISCUSSION of plans of procedure of the council of national defense and advisory commission appointed by the President upon recommendation of the council, was made upon the formal organization of the bodies last week, when they met in the office of Secretary of War Newton D. Baker, and at the new Willard hotel. At a further meeting this week a definite program of procedure may be mapped out.

Members of the council are the secretaries of war, navy, agriculture, commerce and labor. Members of the advisory commission are Daniel Willard, Baltimore; Samuel Gompers, Washington; Franklin H. Martin, Chicago; Howard E. Coffin, Detroit; Bernard Baruch, New York; Dr. Hollis Godfrey, Philadelphia, and Julius Rosenwald, Chicago.

The council was created by a provision in the army appropriation act of the first session of the present congress and is charged with duties involving the coordination of the financial, industrial and commercial resources for the the national defense. The members of the commission were selected with a view to meeting the requirements of the act, which says each shall have special knowledge of some industry, public utility or the development of some natural resource, or to be otherwise specially qualified, in the opinion of the council, for the performance of the duties enumerated.

The secretary of war, as the ranking member of the council, in his address at the opening of the meeting, said, in part:

"We are called a council of national defense, but our duty is not to control those military and naval forces upon which the defense of the nation falls in the event of hostilities, but rather to prepare for the national defense by so co-ordinating the industry and commerce of the nation that it will be strong against any adversary.

> "The creation of this council and its advisory commission inaugurates a new era in our government. It affirmatively declares the interest of all business and industry in the national defense, and looks to labors on our part which will create sympathetic relations between the government and all forms of commercial and industrial enterprise. We are to establish comprehension and sympathy from the government to business and patriotic cooperation from business with the government in the maintenance of the peace and integrity of our country. We have, as it were, a roving commission to seek out the sources of national strength, and to see, by present foresight and preparation, that they are all available for the common use, instantly and fully, in the event of need. Some analogies could doubtless be found for our work in the experience of European nations in recent years, but I am sure my associates in the council of national defense share with me the feeling that the work we are to do will in many aspects be original and adapted to our own mode of thought and life. The country is fortunate that in the inauguration of this great undertaking the council is to be advised by men drawn out of the very life of the industry and commerce of the country, and that any steps taken will be valuable alike in time of peace and war as enlargements and developments of the industrial and commercial genius of our people with a special application of their great energies in these regards to a patriotic object."

The council and the commission were received at the White House by the President. He expressed his appreciation of the significance of the step taken in the organization of the council and pointed out his own hope that the work of the council would be useful in establishing relations of understanding and cooperation between the government and the business interests of the country which would be of the highest value.

Emphasis was placed throughout the discussion at the meetings of the council on the fact that its task was a survey of the entire industrial, financial, commercial and human resources of the nation for the purpose of national strength in time of peace and defense in time of war.

The council and commission expect to begin soon actual work of coordinating the forces mentioned, and it is contemplated that the council will eventually take over the work of the industrial preparedness now being done by the naval consulting board.

Foreign Commerce

Washington, Dec. 12.—In his annual report submitted to congress yesterday, E. E. Pratt, chief of the bureau of foreign and domestic commerce, department of commerce, says there undoubtedly has been a steady and gradual development, from a foreign trade point of view, on the part of American manufacturers and others. He contrasts their attitude of today with that of two years ago, when, he says, many of the manufacturers were apathetic in the matter of foreign trade. Many of them, unfortunately, in view of the great prosperity in this country, are said to be even now somewhat indifferent toward trade expansion.

"There is, however, a growing number of manufacturers who are definitely interested in the cultivation of foreign markets, who believe that it is eminently desirable, at the present time, to lay the foundation for future trade. They are convinced that the United States will be able to hold a considerable portion of the increased business that it has recently obtained. This ever advancing and sincere interest that is being manifested in foreign trade and in all international problems is without doubt the most hopeful feature in the situation looking toward an augmented oversea commerce for the United States."

The Underwood-Simmons tariff act is declared to have been adopted with a view to foreign trade development, but the creation of the tariff commission is said to represent a still more direct recognition of the importance of adopting a foreign trade tariff policy. Mr. Pratt expresses the opinion that the duty of the commission to study commercial relations and to advise regarding commercial policies and commercial treaties has not received the attention from the public that it deserves.

At another point, Mr. Pratt says he believes it is absurd to contend that

the European nations will be able to do more after the war than they did before.

"I believe that domestic wants will have to be filled before the European nations can seriously undertake foreign trade," he continues. "No matter how much they may want it, no matter how much they may need it, they will first have to set their own houses in order."

He further expresses the opinion that the United States will successfully compete with any other nation of the world in any market, but adds that it can do so only after it brings its present industrial equipment and its distributing machinery to the highest point of efficiency. It is his belief that the "war will be followed by a period of intense competition and that the most efficient producers and distributors will win."

He asserts there need be no anxiety said to be felt in some quarters because of the big increase in imports. These, he points out, are for the most part materials not produced in this country at all or not produced in sufficient quantities to meet the needs of domestic manufacturers. After setting forth the great increases made in both the domestic and foreign trade, Mr. Pratt says another important fact in connection with the increased foreign trade is the distribution of exports. Exports to South America, Central America, Australia, South Africa, and the far east, it is pointed out, have increased considerably and it is urged as being important that the United States should get increased business in the markets that are entirely outside of the war zone of Europe.

Contrary to the general opinion, says Mr. Pratt, that the increase in exports is caused entirely by larger shipments of munitions of war the fact is that the increase in the exports of products that have no direct relation to war, which would be sold, war or no war, is more than double the increase in exports of what may be called secondary army supplies.

Secretary Baker's Report

Washington, Dec. 12.—That it would be unwise to allow the dismantling of the industrial establishments which have turned aside from their ordinary business to the manufacture of war, and large plants established for this special subject, is the opinion expressed by Secretary of War Newton D. Baker in his annual report to congress. He further points out that, as any war condition requires the mobilization of the entire industrial resources of the nation, there would seem to be no reason why munitions of war should be separated out for government monopoly, unless that course should turn out to be necessary to prevent the appearance of prospective war profits as a disturbing element in the policy of the nation.

Secretary Baker makes the foregoing comment in connection with legislation that has been enacted to procure military supplies, and with particular regard to the appointment of a board which is studying the question as to the advisability of exclusive government manufacture of war materials. His statement denotes plainly that he is opposed to the idea of the government entering upon such an undertaking. No forecast, he says, can be made as to the conclusions of the board, but the subject is declared to be one of very great importance. Secretary Baker points out that after the passage of the occasion for which plants have entered into the manufacture of war materials, the difficulty will arise as to whether their facilities are to be transformed and devoted to other industrial uses or any part of them preserved in readiness for similar supplies for the United States.

"Some of these plants," Mr. Baker continues, "are located on the seacoast and others at more remote places. It will therefore be incumbent upon the department to select for patronage and encouragement certain of them, and in determining which are to be so chosen a variety of military considerations arise."

Commenting on the council of national defense, created by congress, Secretary Baker says the challenge of the European war brought the attention of congress not merely to the necessity for an increase in the personnel of the regular army, provision for a larger supply of officers, and a better organization of the national guard, but also to the fact that in any great national military emergency industrial mobilization was an indispensable element to success. He points out that the council of national defense was created for the purpose of making an investigation of the financial, industrial and commercial resources of the nation and such provision of them as would enable them to be speedily mobilized for the national defense. This council consists of the secretaries of war, the navy, the interior, agriculture, commerce and labor, with an advisory commission. It is proposed to establish a central body in Washington as a government agency which will catalog the resources of the nation and create "such relations between our industrial and commercial agencies as will equip them to respond instantly to any call from the government."

"In this way," Secretary Baker continues, "the problems which in some countries had to be faced unforeseen until after a national emergency had arisen will be anticipated in the United States, and the confusion, delay and loss due to haste in a moment of national danger will be obviated by rational, just and timely provisions made in advance of trouble. It may well be that some part of the work of the council having a purely military usefulness will not be needed, but the general effect of such a plan in operation will be to produce more healthful and harmonious relations between the government and business, and to give to the great industrial and commercial enterprises of the country a national and patriotic aspect which will both keep the country prepared should emergency arise, and stimulate sound business and industrial methods throughout the country."

Proposed Nitrate Plant

Discussing the appropriation of $20,000,000 made by congress for the establishment of a nitrate plant which he says has been wisely provided for, Secretary Baker points out that it is clear that one object congress had in mind, was that the plant should produce fertilizer with facilities not required for the production of nitric acid. He points out the investigation being made as to the best method of producing nitric acid through the co-operation of the National Academy of Sciences, the American Chemical Society and the bureau of mines, and refers to the preliminary report that has been made on the subject. This report is to be followed by a final one based upon some practical experiments now being made.

Passing upon the various processes of making nitric acid, Secretary Baker says:

"In brief, the character of the problem may be indicated by saying that there are four principal possible sources of nitrogen supply or methods for its development: First, Chile saltpeter, which, of course, is a foreign supply and subject to interruption; second, the recovery of nitrogen from the ammonia liquor of the by-product coke ovens; third, the fixation of atmospheric nitrogen by the cyanamid process; fourth, the fixation of all atmospheric nitrogen by the arc process. In advance of the report of the scientific bodies which are studying the question it would be unwise to enter into any elaborate dis-

cussion of the relative merits of these sources or processes. It may not be improper, however, to say a word with regard to each of them. The Chilean nitrate, at present the main reliance, being a foreign supply, was obviously deemed by congress not sufficiently reliable, and therefore the appropriation was made. The recovery of nitrates from the by-product coke ovens, while a simple laboratory process, has certain scientific limitations due to the difficulty of purifying the ammonia liquor by any processes yet devised, and the additional limitation that an invasion of this field would probably not greatly increase the available stock of fertilizers in peace times, because it would not increase the actual nitrogen supply of the country but would merely divert a part of it, or all of it, at certain times into war materials."

Industrial Mobilization

Washington, Dec. 12.—Failure to make preparation in advance for the use of private industry in the commencement of production on the large scale which has now for the first time characterized war between civilized countries has been brought into sharp prominence by the European war. The necessity, in a war of magnitude, for employing all the manufacturing resources of the nation, both private and public, is clear. This declaration is made by Brig. Gen. William Crozier, chief of the bureau of ordnance, war department, in his annual report for the fiscal year 1916, just made to the secretary of war. In the military legislation of the session of congress just passed, the necessity for this advance preparation has been realized and partially provided for, General Crozier says.

"The national defense act makes in order the appropriation in supply bills of funds for procuring special jigs, dies, fixtures, etc., for fitting private establishments for the manufacture of the particular models of arms and ammunition which are employed in the military service, and grants the war department relief from the statutory competitive methods in providing for the fitting out of particular establishments with these special appliances, and in placing what might be called educational orders, in pursuance of the policy of insurig the readiness of those establishments to turn out war material of satisfactory quality. The supply bills make appropriations, under various headings, for carrying out the policy of the legislation in the national defense act, both in the procurement of fixtures, etc., and in the placing of orders to insure practice and understanding in the use of these appliances for their intended purpose.

"These special provisions are all in the right direction, and will materially aid this department in its plans for utilizing private industry for supplying such emergency needs as may arise. Unfortunately, they do not constitute the only kind of legislation found in the supply bills upon the special utilization of private industry, and are to a certain extent offset in their intentions by restrictions upon the employment of appropriations in general for such patronage of private manufacturers as would of itself operate to prepare them for the government's use, or to keep in existence plants which have already fitted themselves for the manufacture of war material in order to meet the orders of European governments. Some of the appropriations are accompanied by the provision that they shall not be used for placing orders with private manufacture at prices exceeding by 25 per cent the cost of manufacturing the same material in the government arsenals, or the estimated cost of such material when it has not been previously manufactured in the arsenals. As the government has been able, in some cases, to manufacture quite cheaply, this may operate to prevent the placing of orders with private manufacturers.

"Other appropriations are accompanied by the provision that they shall not be expanded in such manner as to prevent the operation of the arsenals at their most economical capacity. As this capacity is probably that of a two-shift rate, the effect of the legislation is to prevent any of the funds appropriated from being applied to private orders until after the arsenals shall be running at full capacity upon a two-shift basis, and then only to the extent of the excess of the appropriations over the amounts necessary to keep the arsenals going upon this basis. Many of the appropriations are of such size as to afford some excess for private orders, but the number of private establishments which can be utilized and trained in time of peace will be less than it would be if there could be employed for the purpose the funds in excess of the amounts which will be necessary to operate the arsenals upon a one-shift basis, at which rate they would themselves also have a larger reserve of expansibility for the needs of war time. There are thus opposing tendencies in the legislation which has been enacted with reference to what has sometimes been spoken of as the mobilization of industry."

Speaking of legislation prohibiting scientific shop management at government arsenals, Gen. Crozier points out that such legislation occurred in the army appropriation act of March 4, 1915, and at the last session of congress the restrictive legislation was carried not only in that measure, but in other supply bills, so that the Watertown, Mass., arsenal was affected for the first time.

He adds: "Piecework has prevailed to a large extent in the ordnance department for many years, and is still pursued. At the Watertown arsenal, where there is not much repetition work, there has heretofore been little piecework, and the compensation for output has been in the form of premiums, which are now forbidden. With the assistance of such time studies as have been made in the past it will be possible to carry on a good deal of this work under the piecework system, and this possibility is under study. In the meantime premiums have ceased, to the expressed dissatisfaction of a number of the employes. If a good method of rate setting is available it does not make much difference whether the stimulus to extra earnings is afforded by the piecework, the premium, the bonus, or any other system of payment; and if such stimulus is to be avoided, and payment made altogether irrespective of the output, it must be by the prohibition altogether of payment for output."

Buys Government Plant

The plant at Denver, Col., where the United States bureau of mines has carried on extensive development work for the benefit of the vanadium, uranium and radium industry, has been sold to the Pittsburgh Radium Co., a newly organized company which will take possession Jan. 16 and operate the plant at Denver, pending the completion of the work of remodeling an abandoned industrial property recently purchased at Beaver Falls, Pa.

Electric furnaces will be installed at the Beaver Falls property immediately, to utilize these products in the manufacture of ferro-vanadium and ferro-uranium. The Denver plant has a capacity of 105 tons of carnotite ore a month, and is understood to have produced about six grams of radium during the past year.

Samuel Jeffrey, of Ithaca, N. Y., is president of the Pittsburgh Radium Co., and W. J. Stevenson, of Pittsburgh, is secretary. The offices are at 311 Park building, Pittsburgh. The company owns its own deposits of carnotite ore in Grand county, Utah.

Market Skids as Holidays Approach

Reports Indicate That November Was Record-Breaking Month—Ship Yards Continue to Hammer Dealers for Equipment—Advances Again Made on Some Lines—Railroads Come Out Freely

THE machine tool market although by no means inactive, shows some signs of the approach of the lull which usually characterizes the holiday period. New inquiries are somewhat less numerous and there is less urgency in closing. The indications, therefore, are that the December volume of business will be less than that for the record month of November. The leading feature of the market in the east is the demand for ship building tools. The Spedden Ship Building Co., Baltimore, which has been out of the market for a long time, now is buying a list of tools, including punches and shears and general machine tools. Another important buyer was Theo. Heide, managing director of the Rosenberg Mek. Verksted, Stavanger, Norway, who closed for a full line of ship yard equipment; Mr. Heide left New York for Norway Dec. 9. A satisfactory development during the past week has been an improved demand from the railroads. The New York, New Haven & Hartford closed for most of the equipment included in the list it issued about six weeks ago, and the Southern railroad closed for the tools it inquired for at about the same time. The Bethlehem Steel Co. continues to enter the market for miscellaneous requirements; this concern recently put out inquiries for a number of additional cranes. An interesting crane order recently placed involves two 100-ton cranes for the General Electric Co.

The Terry Steam Turbine Co., Hartford, Conn., has let a contract for the erection of an addition. The United States Alloy Co., 150 Nassau street, New York, will erect a large plant at Buffalo. The American Can Co. will erect a large plant in Brooklyn. The Continental Can Co., Baltimore, is about to erect a large plant. The New York Ship Building Co., Camden, N. J., contemplates the erection of an addition to its ship yard. It is understood that plans already have been completed for the large new ship yard to be built at New London, Conn., by Charles W. Morse, and that contracts shortly will be let. The Rhode Island Malleable Iron Works, Warwick, R. I., has let a contract for the erection of a new foundry.

Railroads Inquire for Tools

A HEAVY volume of business continues to present itself to dealers in machine tools in the Chicago district. Some long established concerns found November exceeded all previous months in their history for volume of business. As has been the case for some time, the demand is principally for single tools and small lots, with only an occasional inquiry or order for a group of tools sufficient to be considered a large order. Most of the demand is from manufacturers who are simply replacing old equipment or extending their work to meet new conditions. Prices continue to edge to higher levels, scarcely a week passing that some line is not advanced by one manufacturer or another. The feature of the market during the past few days has been the appearance of two large inquiries from railroads. One is by the Chicago, Burlington & Quincy railroad, and the other by the Chicago, St. Paul, Minneapolis & Omaha railroad. Each involves a large number of heavy tools and these are the first railroad listings of importance current in this market for several months. These lists are published in full on pages 1230 and 1231.

Business Brisk in Pittsburgh

MACHINE tool dealers in the Pittsburgh district are promising deliveries much more promptly than they were able to make a few months ago, much to the satisfaction of the domestic trade. Demand for all kinds of tools is heavy. The Carnegie Steel Co. has not yet awarded contracts for about 20 tools for its works at Clairton, Pa. The list includes engine lathes, grinding machines, drilling machines, saws, cutting and threading machines and boring mills. The H. Koppers Co. continues to buy shearing and punching equipment for by-product coke plants in the east and central west. Builders of heavy rolling mill equipment, including the Mesta Machine Co., Mackintosh, Hemphill & Co., and the United Engineering & Foundry Co., are operating plants at capacity.

Can Make Prompt Deliveries

DEMAND for second-hand tools in the Cincinnati market is centered around milling machines, drills and shears, principally because good deliveries cannot be had on new machines. Several builders of lathes are in a position to ship a limited number of tools within a few days after the order is placed. The National Lathe Co. can deliver 30 lathes the first month or six lathes one week from the time the contracts are signed. Orders for new tools are mostly for domestic use. The Recording & Computing Machine Co., Dayton, O., is still purchasing lathes.

Tools Again Advance

SOME machine tool dealers in the Cleveland district have been notified by the builders whom they represent that a further increase in the price of machines will become effective Jan. 1. Lathes and milling machines have been affected. The builders state in the notification blanks that labor and materials have advanced 20 to 100 per cent during the last 10 months and that price revision is necessary in order to stay in business. Deliveries do not seem to be improving. One local tool dealer stated that orders which were filed last year and upon which delivery was promised in March, will not be filled until July or August. Machines which were to have been delivered in August have been delayed until the first of 1918. The matter of deliveries has become serious within the last 30 days. Several inquiries are current in the local market and one local representative of an eastern builder states that one of the largest transactions of the year is hanging fire awaiting confirmation from the factory on shipments. The Warner & Swasey Co., Cleveland, is in the market for an adjustable duplex milling machine with a 20-inch x 6 or 8-foot table., maximum width between spindles, 22 inches, minimum width between spindles, 10 inches. The Goedecke Specialty Mfg. Co., Cleveland, is in the

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All guess work is eliminated in the making of AGATHON STEELS. The quality is controlled by ***facts.*** The analysis is constantly sampled. Test bars are frequently poured during the preparation of every heat. These test bars are broken and the fracture carefully examined. When the eye has been satisfied, the bar is rushed to the laboratory where samples are drilled and subjected to minute chemical analysis.

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Chicago Office: Room 1511-12 Lytton Bldg., 14 East Jackson Blvd., A. Schaeffer, District Representative
Philadelphia Office: 502 Widener Bldg., Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents

market for some miscellaneous equipment. A. R. Palmer is secretary and treasurer, to whom all inquiries should be addressed. The Altman-Taylor Machine Co., Mansfield, O., is in the market for the following equipment: One No. 3 duplex knee-type milling machine; one No. 5 duplex, knee-type milling machine; one centering machine; one No. 3 Cincinnati or equivalent milling machine; one No. 3 Warner & Swasey or equivalent hollow hexagon bar and chucking turret lathe.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

Among New England Factories

LOWELL, MASS.—The Bay State Cotton Corp. will build a 5-story, 200 x 700-foot building.

WORCESTER, MASS.—The Commonwealth Screw Co. has been incorporated to make machine screw products with $50,000 capital by Iver Johnson, president; Frederick H. Lodding, treasurer, and Edith I. Johnson, clerk. Its factory will be at 28 Cherry street and business will start about Jan. 1.

WORCESTER, MASS.—The Norton Grinding Co. has awarded contracts for a reinforced concrete and brick, 5-story, 72 x 200-foot manufacturing building on New Bond street to cost $150,000 and a 2-story, 85 x 175-foot machine shop to cost $50,000 in the rear of the 5-story building. An electric crane will be installed in the machine shop.

BRIDGEPORT, CONN. — The Connecticut Marine & Motor Appliance Co. has been incorporated with $50,000 capital by Frederick LePan, Roger O. Foust and T. N. Chatfield.

BRIDGEPORT, CONN.—The E. W. Carpenter Mfg. Co. has been incorporated to make tools, dies, etc., with $50,000 capital by E. W. Carpenter, president and treasurer; Rollin E. Norton, vice president, and G. E. Smith, secretary.

DERBY, CONN. — The General Ordnance Co., manufacturing non-recoil aeroplane guns, is making large additions to its plant and constantly adding heavy machinery.

HARTFORD, CONN.—The Hartford Industrial Development Co. will build a mill construction, 35 x 68 x 317-foot factory at Hawthorn street which will be leased by the Underwood Computing Machine Co.

NEW HAVEN, CONN.—The F. C. Bushnell Co.'s building was damaged to the extent of $100,000 by fire. The Standard Rivet & Nut Co., an occupant, is one of the heavy losers.

STAMFORD, CONN.—Baer Bros. are enlarging their bronze powder plant to a capacity of over 2,000,000 pounds annually.

CENTRAL FALLS, R. I.—The Glenlyon Dye Works has awarded contracts for a brick, mill construction, 2-story, 60 x 60-foot addition.

From the Alleghenies to the Sea

AUBURN, N. Y.—The city is receiving bids on a filter plant to cost about $200,000. Hazen & Whipple are the engineers in charge of the work.

BROOKLYN.—Taylor & Co., 680 Morgan avenue, has let a contract for the erection of a 1-story, 50 x 200-foot foundry.

BUFFALO.—The Jacob Dold Packing Co. plans to build an addition at William street and Fillimore avenue.

BUFFALO.—The American Radiator Co. has let a contract for the erection of a 1-story, 80 x 100-foot malleable addition.

BUFFALO. — The Niagara Fireworks Co., Michigan and Myrtle streets, has purchased a site on East Delavan avenue for 17 small factory buildings.

FAYETTEVILLE, N. Y. — The Precision Die Casting Co. has been incorporated to manufacture metal castings with $215,000 capital, by H. S. Tenney, W. J. Knapp and T. G. Meacham, Syracuse.

LOCKPORT, N. Y.—The Harrison Mfg. Co., now controled by the United Motors Corporation, will build a large addition, to cost about $300,000.

NEW YORK.—The Efficiency Turbine Co. has been incorporated with $300,000 to manufacture engines and dynamos, by G. C. Scheck and Frederick Camer, New York and Kellogg Sherwood, Brooklyn.

ROCHESTER, N. Y. — The Lake Avenue Baptist church plans to build a church, to cost about $100,000. Foote, Headly & Carpenter, Carter building, are preparing the plans.

ROCHESTER, N. Y.—The Taylor Instrument Co., 95 Ames street, has let a contract for the erection of a 1-story, 20 x 120-foot addition.

SYRACUSE, N. Y.—The Durston Gear Co. has let a contract of a 1-story, 50 x 108-foot manufacturing addition.

SYRACUSE, N. Y.—The board of education plans to build a 2-story school, to cost about $250,000. Sacket & Park, 34 Syracuse Savings Bank building, are preparing the plans.

TONAWANDA, N. Y.—The New York Central railroad plans to construct a bascule bridge over Tonawanda creek on Webster avenue. G. W. Kittredge, Grand Central Terminal, New York, is chief engineer.

BORDENTOWN, N. J. — The Keystone Steel Tube Co. has leased a plant along the Delaware river and is equipping the works for the manufacture of steel tubes.

CAPE MAY, N. J.—The board of education will erect new high school on Washington street to cost $100,000.

JERSEY CITY, N. J.—The M. W. Kellogg Co., founder and machinist, has let a contract for the erection of a 1-story, 100 x 105-foot addition.

JERSEY CITY, N. J.—The Air Reduction Co., 50 Broad street, New York, has let a contract to the H. D. Best Co., 52 Vanderbilt avenue, New York, for the erection of a 1-story, 30 x 100-foot plant here.

NEWARK, N. J.—The Witteman Aircraft Co. is erecting a new plant, 65 x 200 on an 8-acre plot on Meadow street for the manufacture of aircraft. Charles R. Witteman is president of concern.

NEWARK, N. J.—The Keystone Dyestuff & Chemical Co. has been incorporated with $300,000 capital to manufacture and deal in dyes, acids, chemicals and colors by Edward J. Fuchs, Henry C. Beecher, Newark; Charles J. Juster, Woodhaven, L. I.

NEWARK, N. J.—The Central Railroad of New Jersey has taken out a permit for a concrete hollow-tile, brick and steel terminal, stores and offices, two stories, 68 x 100 feet, to be located at 832 Broad street. The structure will cost $483,000.

PERTH AMBOY, N. J.—The Raritan Copper Works has let a contract for the erection of a 2-story, 40 x 60-foot blast furnace building.

PERTH AMBOY, N. J.—Perth Amboy Cornice & Skylight Works, has been incorporated with $100,000 capital to manufacture and deal in copper and sheet iron and to construct skylights and roofs by Samuel Diamond, Joseph Diamond, Perth Amboy, Victor Diamond, Philadelphia.

CHESTER, PA.—Citizens have voted a bond issue of $500,000 for erecting school buildings.

PITTSBURGH. — The Panhandle Traction Co. plans to build a freight warehouse along Forbes, Boyd and Hooper streets. W. B. Atwood, Wheeling, is general manager of the company.

PITTSBURGH.—The St. Louis Independent Packing Co., 3857 Chateau avenue, St. Louis, Mo., plans to build a cold-storage plant and meat depot at Hamilton and Torrence avenues, east end, to cost about $53,000. Charles Krause is preparing the plans.

SOUTH WILMINGTON, DEL.—The Enterprise Foundry Co. plans to enlarge and improve the plant recently purchased from W. M. Myers.

BALTIMORE.—The Baltimore Enamel & Novelty Co., Woodall and Clement streets, will erect a 2-story, 262 x 458-foot, $125,000 mill construction factory.

IRON ORE
is getting Scarce

Last year was a "hummer." Every condition for facilitating shipment that could possibly arise, was right on the job. The result was, an immense tonnage of ore was brought down.

This year, however, things are bound to be different. Shipping conditions will not be able to repeat—and, furthermore, there is sure to be an immense shortage of ore.

Just think what this will mean to you if you order too late!

We have warned you.

Don't be caught napping.

ACT NOW !

LET US FILL YOUR REQUIREMENTS

We are in a most excellent position to interest you in SERVICE, QUALITY and PRICE.

Don't take chances on your 1917 ore.

Shipments of our Lake Superior Ores are made from Open Pit Mines.

WRITE US

The Tod-Stambaugh Company

Perry-Payne Building

CLEVELAND - - OHIO

Say you saw it in THE IRON TRADE REVIEW

Here's the Demand. Can You Meet It?

List of equipment desired by the Chicago, Burlington & Quincy railroad, N. L. Hopkins, purchasing agent, Chicago.

One 12-inch engine lathe.
Three bolt lathes, 16-inch swing.
One engine lathe, 16-inch swing.
One 18-inch engine lathe.
Two 20-inch engine lathes.
One heavy duty engine lathe, 24 or 27-inch swing.
One 32-inch engine lathe.
One 52-inch engine lathe.
One heavy-duty, truck-wheel tire-turning lathe.
One 2¼-inch by 24-inch turret lathe.
One turret lathe with 7½-inch bar capacity.
One vertical turret lathe, 24-inch swing.
One vertical turret lathe, 48-inch swing.
One double quartering machine.
One 8-foot radial drill.
One 5-foot radial drill.
Four upright drills.
One 6-foot radial drill.
One 48-inch x 48-inch x 10-foot planer.
One 28-inch shaper.
One 24-inch x 24-inch x 48-inch crank planer.
Two 18-inch slotters.
One heavy duty Universal drill.
One link radius grinder.
One universal grinding machine.
One twist-drill grinder.
Three double end bench grinders.
One 400-ton hydraulic press.
One 100-ton hydraulic press.
One 250-ton hydraulic press.
Two pipe threading machines.
One single head bolt threader.
One 36-inch double end punch and shear.
One 60-inch single end shear.
One 60-inch single end punch.
One 52-inch single end shear.
One 52-inch single end punch.
One 24-inch double end punch and shear.
One 12 x 60-inch bulldozer.
One forging and upsetting machine.
One 400-pound power driven hammer.
Twenty-seven 48-inch forges.
Two pneumatic welders and swedgers.
One flue expander.
One power squaring shear.
One 8-foot double-cornice brake.
One band saw.
One single spindle shaping machine.
One hand jointer with boring attachment.
Eleven oil furnaces.
Two 5-horsepower motors.
One 500-horsepower motor.
One 500-pound capacity electric truck.
One 20-inch tool lathe.
One 3¼-inch x 30-inch turret lathe.
One heavy-duty upright drill press.
One 28-inch heavy-duty shaper.
One triple head bolt cutter.
One single end punch and shear.
One bolt head-upsetting and forging machine.
One circular saw grinder.
One band saw filer.

Activities in the Central States

AKRON, O.—The Portage Iron & Wire Co. has been incorporated with $50,000 capital, by E. Vogelbeer, A. J. Herman, William Hoffman, et al.

CINCINNATI.—The Sayers & Scoville Co. has increased its capital from $150,000 to $450,000, to build a new plant. The company manufactures carriages and hearses.

CINCINNATI.—The A. M. Lewin Lumber Co. will be in the market for wood working machinery for an addition of two stories which will be built at once. A power plant of the capacity of 300 horsepower will also be erected. The company will also be in the market soon for a number of motors to operate its machinery.

DAYTON, O.—Fred P. Beaver, 215 W. Second street, will build a factory 50 x 200 feet.

SPRINGFIELD, O.—The plant of the O. S. Kelly Co. was damaged by fire to the extent of $75,000. The company manufactures piano plates.

STEUBENVILLE, O.—LaBelle Iron Works plans to erect an $18,000 fuel gas plant.

HUNTINGTON, W. VA.—A factory 200 x 200 feet will built by the Standard Stamping Co. Plans are being prepared.

BRAZIL, IND. — A factory building, to cost $500,000, will be erected by the Clay Products Co. next spring. The company makes paving brick. Plans have not been prepared.

COLUMBUS, IND. — The Columbus Art Metal Co. has been incorporated with $100,000 capital. Directors are W. H. Alford, J. V. Hilger and H. L. Rost.

EAST CHICAGO, IND.—The Wright Mfg. Co. has been incorporated with $60,000 capital to manufacture machinery. Directors are G. W. Fite, N. T. Wright and Charles P. Packer.

EVANSVILLE, IND.—The Farmers Utility Co. has been incorporated to manufacture farm machinery, with $50,000 capital stock, by William J. Schuler, H. C. Weber and Hayward Flickner.

FT. WAYNE, IND.—A small amount of light machine shop equipment will be needed by Don H. Harris, 3230 Webster St., who will build a public garage, 44 x 150 feet.

INDIANAPOLIS.—The Ott Grinder Co. has been incorporated with $50,000 capital to manufacture grinding machines. Directors are A. J. Ott, C. L. Ott and Samuel Dowden.

INDIANAPOLIS.—The Gordon Little Co. has been incorporated to manufacture screw machine products with $10,000 capital, by C. C. Gordon and F. E. Little.

INDIANAPOLIS. — The Terre Haute Indianapolis & Eastern Traction Co., and the Indianapolis Traction & Terminal Co. have purchased the old Federal League baseball park in the heart of the downtown wholesale district and will build as soon as possible a freight terminal for electric lines to cost $400,000. The companies say the terminal will be the largest in the world maintained solely for handling freight from electric railways.

PERU, IND.—Fire recently caused a loss of $75,000 in the car repair shop of the C. & O. railroad.

RICHMOND, IND. — The Swayne-Robinson Co. is planning to erect another foundry unit to duplicate that built early the present year.

HAWTHORNE, ILL.—The Western Electric Co. will build a manufacturing plant, consisting of four buildings. Bids are being taken by the owners.

In the South and Around the Gulf

NORFOLK, VA. — The Berrethal Machine Co. is commencing the erection of a 1story, 62 x 72-foot foundry.

SUFFOLK, VA. — The Berrethal Machine Co. is erecting a 1-story, 62 x 72-foot foundry.

CHATTANOOGA, TENN.—The city soon will let a contract for a 40 x 65-foot machine shop.

KNOXVILLE, TENN.—The John G. Duncan Co. is asking for dealers' prices on a water tube boiler, 300 to 400 horsepower, immediate delivery; Sterling preferred.

BOWLING GREEN, KY.—The Automatic Emergency Brake Co. has been incorporated at $55,000, by W. H. Rabold, N. D. Rabold, and A. M. Rabold.

DAYTON, KY.—Two of the plants of the Computing & Recording Machine Co. were damaged by fire on the evening of Nov. 24, with a loss of $150,000. The company will immediately erect new buildings for which equipment will be needed including a large number of turret lathes.

DANVILLE, KY.—The Cincinnati Southern Railway Co. has purchased 300 acres near the city and will establish shops, a roundhouse, etc., at a cost of $500,000.

HILLSIDE, KY.—Fire damaged the tipple and power house of the Advance Coal Co. to the extent of $30,000. W. S. Thomson, Madisonville, Ky., is superintendent.

LOUISVILLE, KY.—Machine shops will be erected in Louisville by the Illinois Central railroad at a cost of $18,000.

LOUISVILLE, KY.—The Standard Oil Co. will erect a refining plant on a site near the state fair grounds to cost approximately $1,000,000. C. P. Collings is president of the local company.

OWENSBORO, KY.—The Sanitary Fountain & Cooler Co. has been incorporated with $50,000 capital by C. T. and J. H. Daniel, Charles Bauman and D. M. Griffith, to manufacture a patented drinking fountain.

WINCHESTER, KY.—The Love Foundry & Machine Co. has been incorporated with $10,000 capital by James Love, J. G. Hey and L. B. Patterson.

NEW ORLEANS.—The Southern Car Co., High Point, N. C., plans to build car shops at New Orleans at a cost of $500,000.

NEW ORLEANS, LA.—The Stern Foundry & Machinery Co. will build a foundry and machine shop at its present plant at a cost of $100,000.

NEW ORLEANS.—The Richardson Aeroplane Co., recently incorporated with $500,000, plans to build a large plant in this city. F. T. Richardson is president.

NEW ORLEANS. — The Stern Foundry & Machinery Co., N. S. Stern, president, will expend about $100,000 in building a foundry and machine shop and other additions to its plant.

Machine Tools and Equipment Wanted

The Chicago, St. Paul, Minneapolis & Omaha railroad, L. Sheddon, purchasing agent, St. Paul, wants the following:

One automatic high speed car Gainer.
One 16-inch hand planer and jointer.
One 9-inch molder.
One 48-inch car wheel borer.
One 36-inch drill press.
One angle and channel bar punch and shear.
One 42-inch standard planer.
One 1½-inch bolt cutter, triple head.
One bulldozer.
One eye bender.
One 1½-inch bolt heading, upsetting and forging machine.
One 80-pound hammer.
One high speed double spindle shaper.
One 37-inch, 3-drum, 8-roll sander.
One double-head emery wheel.
One 2,500-pound single frame guided ram steam hammer.
One spring banding machine, 60-ton capacity.
One heavy pattern single geared toggle press.
One power gap shear.
One circle and slitting shear.
One heavy burring machine.
One 20-inch, high-speed, sliding-head drill.
One universal milling machine, 3 x 12 x 20.
One 20-inch x 8-foot lathe.
One 100-inch boring and turning mill.
One engine lathe, 120-inches between centers.
Two 18-inch x 10-foot engine lathe.
One rotary bevel shear.
One radius link grinding machine.
One link-pin grinding machine.
One high-speed drill, 20-inch table.
One pipe-threading machine.
Two grinding wheel stands.
One power cutoff saw.
One arm sander.
One 24-inch x 24-inch crank planer.
One power hammer.
One 42-inch swing engine lathe.
One 24-inch crank shaper.
One 12-foot bending rolls.
One 1½-inch triple head bolt cutter.
Two portable hand operated cranes.
Two blowers.

Western and Intermountain Territory

ALTOONA, KAS.—Plans are being made for an electric light system and improvements to the waterworks plant at a cost of $20,000. Riley & Hardman, Parsons, Kan., are engineers.

TOPEKA, KAS.—Plans are being prepared by Walter Arnold, county engineer, for a 160-foot Baltimore steel truss bridge over Soldier creek.

NORFOLK, NEB.—The Albaugh-Dover Co., Chicago, is planning to build a plant in Norfolk for the manufacture of farm tractors, with an investment of $100,000.

OMAHA, NEB.—The E. H. Sprague Mfg. Co. has been incorporated to manufacture automobile accessories and is occupying the plant of the Standard Foundry Co.

OMAHA, NEB.—A project is on foot to build a steel bridge between Omaha and Council Bluffs. The county clerk at Omaha has the details.

OMAHA, NEB. — The Commercial Realty Co., 514 Ware block, is planning to erect a 10-story hotel, 66 x 132 feet at Sixteenth and Harney streets, to cost $400,000. John and Alan McDonald, 905 Omaha National Bank building, are architects.

CLARK, S. D.—The city council is considering granting a franchise for an electric light plant and system to cost $30,000.

BILLINGS, MONT.—The Burlington road will spend $10,000 in enlarging the roundhouse which is now being used by the Northern Pacific Railway here.

BOZEMAN, MONT.—R. W. Lysle, Chicago, has applied for a gas franchise here with view of constructing a $150,000 plant.

DENVER.—The Vulcan Iron Works will build a plant to cost $12,000. R. A. Pierce is architect.

LAUREL, MONT. — The Northern Pacific railway will spend $15,000 in enlarging its shops here.

LIVINGSTON, MONT. — Plans are being made for a waterworks system to cost $225,000.

MIDVALE, UTAH. — Bonds for $35,000 have been voted for the construction of a municipal waterworks system and contracts will be let soon.

OGDEN, UTAH.—The Western Foundry & Machine Co. plans to build a foundry costing $100,000.

COEUR D'ALENE, IDA. — The Central Heating & Lighting Co. is planning to spend $100,000 for a heating and power plant.

LEWISTON, IDA.—Bids will be received by C. F. Leland, city clerk, up to 8 p. m., Nov. 20 for furnishing the city with two turbine pumps with bronze impellers to deliver, 1,600 gallons of water per minute through 4,000 feet of 12-inch pipe, having a suction head of 15 feet and a total discharge of 200 feet. Check certified by some bank or trust company in the city for 5 per cent of bid required. Each pump is to be direct-connected to an electric motor, 3-phase, 60 cycles, alternating current and 2,200 volts.

MACHAY, IDA.—Fire recently damaged the machine shop of the Empire Smelter Co. to the extent of $10,000.

TWIN FALLS, IDA.—Louis Kelsey, engineer, 410 Selling building, Portland, Ore., is making plans for a municipal waterworks to cost $300,000.

New Business in Eastern Canada

WINNIPEG, MAN.—The Winnipeg Machine Exchange, Sutherland and Gladstone streets, is in the market for a boring mill with a 30 to 42-inch table.

DESERONTO, ONT.—The Dominion Hardwoods Co. has commenced the erection of a large factory at Deseronto and will install a large quantity of new machinery.

GALT, ONT.—Sheldons Co., manufacturer of blowers, fans, heating apparatus, etc., will build a factory at Galt to cost $18,000. The building will be of pressed brick construction.

GRANTON, ONT.—C. W. McRoberts, will replace all steam driven machinery in his plant by electrically operated machinery.

GUELPH, ONT.—The Dalyte Lamp Co. will build an addition to its factory to cost $15,000. W. A. Maconey, is architect.

KINMOUNT, ONT.—H. Deltman is in the market for a 60-horsepower engine and a 75-horsepower boiler, suitable for saw mill.

SAULT STE. MARIE, ONT.—The Sault Shipping Co. has been incorporated to build vessels, boats, etc., with $300,000 capital by Rex A. Nicholson, 21 Sussex avenue; Alexander T. Taylor, Joseph G. Gibson and others, all of Toronto.

SMITH'S FALLS, ONT. — The Canadian Cooperage Mfg. Co. will commence work at once on the erection of a factory to cost $20,000 to replace the one recently damaged by fire. F. F. Kessel, manager, is in the market for new machinery including, 75 horsepower engine, motor, etc.

TORONTO.—The Dodge Mfg. Co. has been incorporated with $1,500,000 capital to do a general foundry and manufacturing business.

TORONTO.—The William Davies Co. has received a permit for the erection of a cold storage plant to cost $100,000 at Front and Cypress streets.

TORONTO.—The Canadian Carbon Co. has received a permit for the erection of a new factory on Paton road, Toronto, to be 3-stories high and to cost $23,500.

TORONTO.—Mr. Bennett, 206 West King street, is in the market for 18 to 24-inch engine lathes, shaper, miller, drill presses, tool grinder, etc.

TORONTO.—The McMullen & Lee Co. has been incorporated with $40,000 capital, to manufacture automobiles, tools and machinery, by Harold S. McMullen, Wm. H. Lee, and John F. MacGregor, of Toronto.

TORONTO.—The Central Motors Co. has been incorporated with $40,000 capital, to manufacture automobiles. The provisional directors are George W. Boake, Bidwell N. Davis, Frederick Boyce and others of Toronto.

TORONTO. — The Shell-Bar Grate Co. has been incorporated with $40,000 capital to carry on business as iron founder, mechanical engineer and manufacturer of munitions. The provisional directors are Joseph M. Bullen, Harold L. Steele and Wendell Osborne, of Toronto.

MONTREAL.—The Dominion Boiler & Foundry Co. has been incorporated with $200,000 capital, to manufacture furnaces, boilers, radiators, machinery, etc., by Charles W. Webb, Joseph H. Charbonneau, Victor Pelletier and others of Montreal.

ST. STEPHEN, N. B.—Haley & Sons have commenced the erection of a lumber mill to cost $30,000 to replace the one recently destroyed by fire. Machinery including saws, planers, lathes, etc., will be purchased for the plant.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

Bessemer valley	$35.00
Bessemer, Pittsburgh	35.95
Basic, Pittsburgh	30.95
Basic, eastern Pa.	30.00 to 31.00
Basic, Buffalo	35.00
Malleable, Pittsburgh	31.95 to 33.95
Malleable foundry, Chicago	30.00
Malleable foundry, Philadelphia	32.00 to 33.00
Malleable foundry, Buffalo	35.00
No. 1X foundry, Philadelphia	30.50 to 31.50
No. 2 foundry, Pittsburgh	31.95 to 33.95
No. 2 foundry, Cleveland	30.30 to 31.30
No. 2 foundry, Ironton	30.00
No. 2 foundry, Chicago	30.00
No. 2X foundry, Philadelphia	29.50 to 30.50
No. 2X foundry, N. J. tidewater	29.50 to 30.50
No. 2X foundry, Buffalo	35.00
No. 2 plain, Philadelphia	29.00 to 29.50
No. 2 plain, N. J. tidewater	29.00 to 29.50
No. 2 plain, Buffalo	35.00
No. 2 southern, Birmingham	23.50 to 25.00
No. 2 southern, Cincinnati	26.40 to 27.90
No. 2 southern, Chicago	26.00 to 27.00
No. 2 southern, Phila. delivery	28.00 to 30.00
No. 2 southern, Cleveland	27.50 to 29.00
No. 2 southern, New York docks	28.25 to 30.25
No. 2 southern, Boston docks	28.00 to 30.00
No. 2 south. interior, New Eng.	29.00 to 31.00
No. 2 southern, St. Louis	
Virginia No. 2X furnace	26.00 to 28.00
Virginia, No. 2X, Philadelphia	28.75 to 30.75
Virginia, No. 2X, Jersey City	29.00 to 31.00
Virginia 2X, Boston points	29.25 to 31.25
Gray forge, eastern Pa.	28.50 to 29.00
Gray forge, Pittsburgh	29.95
Gray forge, Birmingham	22.00
Silveries, 8 per cent, furnace	36.00 to 37.00
Silveries, 8 per cent, Chicago	38.50
Low phos. Standard, Phila.	55.00
Low phos. Lebanon, Pa., furnace	50.00 to 55.00
Low phos., Pittsburgh	50.00 to 51.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	31.75 to 32.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	26.00 to 27.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	5.95
Mesabi Bessemer, 55 per cent, ton	5.70
Old range non-Bes., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores.
(Per unit delivered eastern Pa.)

Old Bess., crude, 58 per cent.	10.50c to 11.00c
Old Bes. concent., 65 per cent	11.00c to 11.50c
Harmony concent., 63 per cent	11.50c to 11.75c
Lump (at mines)	$5.75

Foreign Ores.
(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	nominal
For'n non-Bess., 50 to 65 per cent	nominal

COKE

(At the ovens.)

Connellsville furnace	$7.25 to 7.75
Connellsville fur., contract	4.00 to 4.25
Connellsville foundry, contract	6.00 to 6.75
Connellsville foundry	9.00 to 9.50
Wise county furnace, contract	4.50 to 5.00
Wise county foundry, contract	5.00 to 7.00
Pocahontas foundry, contract	5.00 to 7.00
Pocahontas furnace, contract	4.50 to 5.00
New River foundry, contract	5.25 to 5.75
New River furnace, contract	5.00 to 5.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, or delivered prompt	$160 to 165
Ferro manganese, 80 per cent, seaboard, or delivered, contract	160 to 165
Spiegel, 20 per cent, fur. early and last half	50.00 to 55.00
Ferro-silicon, 50 per cent, Pbg.	95.00 to 100.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $41.00; 10 to 11 per cent, $42.00; 11 to 12 per cent, $43.00; 12 to 13 per cent, $44.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$55.00 to 60.00
Forging billets, Phila.	75.00 to 85.00
Forging billets, Pbgh., nominal	75.00 to 85.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh (nom.)	70.00
Bessemer billets, Youngstown	60.00
Bessemer billets, Pittsburgh	60.00
Open hearth billets, Pittsburgh	60.00
Open hearth billets, Youngstown	60.00
Bess. sheet bars, Youngstown	60.00
Op. h'th sheet bars, Youngstown	60.00
Bess. sheet bars, Pittsburgh	60.00
Open hearth sheet bars, Pbgh.	60.00
Muck bars, Pittsburgh (nominal)	50.00

SKELP

Grooved steel skelp	3.00c
Sheared steel skelp	3.50c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bess. rails, Pbgh & Chgo.	$38.00
Stan. op-h'th rails, Pbg. & Chgo.	40.00
Light rails 8 to 10 lbs., Pbgh.	49.00
Light rails, 8 lb., Chicago	48.00
Light rails, 12 to 14 lbs., Pbgh.	48.00
Light rails, 12 lbs., Chicago	46.00
Light rails, 16 to 20 lbs., Pbgh.	47.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Chgo.	$45.00
Light rails, 25 to 45 lbs., Pbgh.	46.00
Light rails, 25 to 45 lbs., Chgo.	44.00
Relaying rails, standard, Pbgh. and Chicago	$23.00 to 24.00
Relaying rails light, Chicago	24.00 to 25.00
Angle bars, st. sect., Pbgh. base	2.00c to 2.50c
Angle bars, st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	3.40c
Spikes, railroad, Chicago	3.00c to 3.10c
Track bolts, Pittsburgh	4.50c to 4.75c
Track bolts, Chicago	4.25c to 4.50c
Tie plates, Chicago	$55.00 to 60.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	3.00c
Structural shapes, Pbgh.	3.00c to 3.25c
Structural shapes, Philadelphia	3.159c to 3.659c
Structural shapes, Chicago	3.19c to 3.75c
Structural shapes, New York	3.169c to 3.669c
Tank plates, Chicago	3.69c to 4.25c
Tank plates, Pittsburgh (con.)	3.50c to 4.50c
Tank plates, Pittsburgh	4.50c to 5.00c
Tank plates, Philadelphia	3.659c to 4.159c
Tank plates, New York	3.669c to 4.169c
Bars, soft steel, Chicago	3.09c to 3.50c
Bars, soft steel, Pbgh (con.)	2.90c
Bars, soft steel, Pittsburgh	3.00c to 3.25c
Bars, soft steel, New York	3.169c
Bars, soft steel, Philadelphia	3.159c
Hoops, carloads, Pbgh. contr.	3.25c
Hoops, Pbgh.	4.00c to 4.25c
Bands, Pittsburgh	3.90c to 4.10c
Bands, Pittsburgh (contr.)	2.90c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chicago	2.75c to 3.00c
Bar iron, Philadelphia	3.159c
Bar iron, Cleveland	3.00c
Bar iron, New York	3.169c
Bar iron, Pittsburgh	3.25c
Hard steel bars, Chicago	2.75c to 3.00c

SHEETS

(In cents per pound.)
(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	4.30 to 5.05
22 to 24	4.35 to 5.10
25 and 26	4.40 to 5.15
27	4.45 to 5.20
28	4.50 to 5.25
29	4.55 to 5.30
30	4.65 to 5.40

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	4.30 to 4.80
17 to 21	4.35 to 4.85
22 to 24	4.40 to 4.90
25 to 27	4.45 to 4.95
28	4.50 to 5.00
29 and 30	4.55 to 5.05
30½ and 31	4.60 to 5.10

GALVANIZED.

Gage.	Bessemer.
10 and 11	5.25 to 6.00
12 to 14	5.35 to 6.10
15 and 16	5.50 to 6.25
17 to 21	5.65 to 6.40
22 to 24	5.70 to 6.45
25 and 26	5.95 to 6.70
27	6.10 to 6.85
28	6.25 to 7.00
29	6.45 to 7.20
30	6.65 to 7.40

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	3.90 to 4.40
9 to 10	3.75 to 4.25
11 to 12	3.75 to 4.25
13 and 14	3.85 to 4.35
15 and 16	3.90 to 4.40

No. 28 black, Chicago	4.69c
No. 28 galvanized, Chicago	5.19c
No. 10 blue annealed, Phila.	3.909c to 4.659c
No. 10 blue annealed, Chgo.	4.69c

TIN PLATE

Tin plate, 100 lb., coke base	6.50c to 7.00c
Terne plate	5.75c

IRON AND STEEL PIPE

(Prices adopted Dec. 4, 1916.)

Steel.	Black.	Galv.
Butt weld:—		
⅛, ¼ and ⅜ in.	59	32½
½ in.	63	48½
¾ to 3 in.	66	52½
Lap weld:—		
2 in.	59	46½
2½ to 6 in.	62	49½
7 to 12 in.	59	45½
13 and 14 in.	49½	....
15 in.	47	....

Iron.	Black.	Galv.
Butt weld:—		
⅛ and ¼ in.	44	16
⅜ in.	45	17
½ in.	49	30
¾ to 1½ in.	52	35
Lap weld:—		
1¼ in.	38	22
1½ in.	44	29
2 in.	45	30
2½ to 6 in.	47	33
7 to 12 in.	46	32

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	46
Iron 3½ to 4½ inches l. c. l.	36

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Nov. 24, 1916.)
(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$3.00
Plain wire, jobbers', Pittsburgh	2.95
Galvanized wire, jobbers', Pbgh.	3.65
Polished staples, Pbgh.	3.15
Galvanized staples, Pbgh.	3.85
Barb wire, painted, jobbers', Pbgh.	3.15
Barb wire, galv., jobbers', Pbgh.	3.85

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 50; cut threads, 40, 7 and ½, larger or longer, 35.

Machine bolts with hot pressed nuts ¾ x 4 inches, smaller or shorter rolled 50, and 5; cut, 40, 10 and 5; larger or longer, 40.

Cold pressed, semi-finished hexagon nuts, 60.

Gimlet and cone point lag bolts, 50. Hot pressed square nuts, blanks, $2.60 off; tapped $2.40 off. Hot pressed hexagon nuts, blank, $2.60 off; tapped, $2.40 off.

Cold pressed square nuts, blank, $2.20 off; tapped, $2.00 off. Cold pressed hexagon nut, blank, $2.50 off; tapped, $2.25 off.

RIVETS

Structural rivets, Pbgh.	4.25c
Boiler rivets, Pbgh.	4.35c
Tinner's rivets, 45, and 10 off, Pittsburgh.	

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	3.00c

STANDARD STEEL CHAIN

Chain, ¾ inch proof coil	6.00c

COLD ROLLED STRIP STEEL

Base price 6.50c to 7.00c per 100 pounds, hard, coils 1¼ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$44.00 to 45.00
Six-inch and larger, Chicago	41.00 to 42.00
Six-inch Class B, New York	41.50
Four-inch Class B, New York	44.50
Four to six-inch Birmingham	37.00
Six-inch and larger, Birmingham	34.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.60c
Steel squares, 2-in. & ov., Cleve.	4.25c
Steel rounds, 2-in. & ov., Cleve.	4.25c
Steel bars, und. 2 in., Cleveland	3.75c
Steel bars, Detroit	3.60c
Steel bars, Philadelphia	3.75c
Steel bars, New York	3.75c
Steel bars, St. Louis	3.65c
Steel bars, Cincinnati	3.70c to 4.25c
Steel bars, St. Paul	3.70c
Steel bars, over 2-in., Buffalo	4.40c
Steel bars, Buffalo	3.75c
Iron bars, Chicago	3.60c
Iron bars, Cleveland	3.70c
Iron bars, Detroit	3.60c
Iron bars, St. Louis	3.60c
Iron bars, Cincinnati	3.70c to 4.25c
Iron bars, Philadelphia	3.50c
Iron bars, New York	3.75c
Shapes, Chicago	3.70c
Shapes, Detroit	3.70c
Shapes, St. Louis	3.75c
Shapes, St. Paul	3.80c
Shapes, New York	3.75c
Shapes, Cleveland	3.85c
Shapes, Philadelphia	3.75c
Shapes, Buffalo	3.85c
Shapes and plates, Cincinnati	3.80c to 4.35c
Plates, Chicago	4.35c
Plates, Detroit	4.35c
Plates, St. Louis	4.40c
Plates, St. Paul	4.45c
Plates, New York, wide	5.00c
Plates, New York, narrow	4.75c
Plates, Cleveland	4.35c
Plates, Philadelphia	4.50c to 5.00c
No. 10 blue anl. sheets, Chicago	4.25c
No. 10 blue anl. sheets, Cleve.	4.25c to 4.50c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. L.	4.30c
No. 10 blue anl. sheets, Cinci.	4.40c
No. 10 blue anl. sheets, St. Paul	4.40c
No. 10 blue anl. sheets, Detroit	4.25c
No. 28 black sheets, Chicago	4.75c
No. 28 black sheets, Cleveland	4.75c
No. 28 black sheets, Cincinnati	4.40c
No. 28 black sheets, Detroit	4.50c
No. 28 black sheets, St. Louis	4.95c
No. 28 black sheets, St. Paul	4.90c
No. 28 galv. sheets, Chicago	6.75c
No. 28 galv. sheets, Cleveland	6.50c
No. 28 galv. sheets, Cincinnati	6.00c
No. 28 galv. sheets, Detroit	6.50c
No. 28 galv. sheets St. Louis	6.85c
Hoops, Cleveland	4.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$29.00 to 30.00
Angle bars, steel, St. Louis	21.00 to 21.50
Arch bars and transoms, St. L.	29.50 to 30.00
Arch bars and transoms, Chgo.	31.50 to 32.00
Cast, No. 1, St. Louis	19.50 to 18.00
Boiler plate, cut, No. 1, Chgo.	15.00 to 15.50
Boiler plate, cut, No. 1, St. L.	14.00 to 14.50
Boiler punchings, Chicago	18.00 to 19.00
Bundled sheet, Cincinnati	13.00 to 13.50
Busheling, No. 1, Chicago	19.00 to 19.50
Busheling, No. 1, Cincinnati	17.00 to 17.50
Busheling, No. 1, Cleveland	19.00 to 19.50
Busheling, No. 1, St. Louis	19.50 to 20.00
Busheling, No. 2, Chicago	14.00 to 14.50
Cast borings, Chicago	10.25 to 10.75
Cast borings, Cincinnati	9.00 to 9.50
Cast borings, Cleveland	10.75 to 11.00
Cast borings, St. Louis	10.00 to 10.50
Cast, No. 1, Chicago	16.50 to 17.00
Cast, No. 1, Cincinnati	16.00 to 16.50
Cast, No. 1, Cleveland	19.00 to 19.50
Cast, No. 1, St. Louis	17.50 to 18.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	25.50 to 26.00
Grate bars, Cleveland	13.50 to 13.75
Iron axles, St. Louis	33.50 to 34.00
Iron axles, Cleve.	45.00 to 46.00
Knuckles, coup., Chicago	25.00 to 25.50
Knuckles, coup., St. Louis	26.00 to 26.50
Locomotive tires, Chicago	29.00 to 30.00
Locomotive tires, St. Louis	29.00 to 30.00
Machine shop turnings, Chicago	10.50 to 11.00
Machine shop turnings, Cleve.	10.50 to 11.00
Machine shop turn'gs, Cincinnati	8.50 to 9.00
Machine shop turnings, St. L.	10.50 to 11.00
Malleable agricultural, Chgo.	16.00 to 16.50
Malleable agricultural, St. Louis	17.00 to 17.50
Malleable, Cincinnati	13.50 to 14.00
Malleable railroad, Chicago	19.50 to 20.00
Malleable railroad, St. Louis	18.00 to 18.50
Pipes and flues, Cleveland	16.00 to 16.50
Pipes and flues, Chgo.	16.50 to 17.00
Pipes and flues, St. Louis	16.50 to 17.00
Railroad wrought, No. 1, Cleve.	30.00 to 31.00
Railroad wrought, No. 1, Chgo.	26.50 to 27.00
Railroad wrought, No. 1, Cinci.	21.00 to 22.00
Railroad wrought, No. 1, St. L.	25.00 to 25.50
Railroad wrought, No. 2, Chgo.	25.00 to 26.00
Railroad wrought, No. 2, St. L.	24.50 to 25.00
Shafting, St. Louis	28.00 to 29.00
Springs, Chicago	25.00 to 25.50
Steel car axles, St. Louis	38.00 to 39.00
Steel car axles, Chicago	39.00 to 40.00
Stove plate, Chicago	12.50 to 13.00
Stove plate, Cleveland	13.50 to 13.75
Stove plate, Cincinnati	12.00 to 12.50
Stove plates, St. Louis	15.50 to 16.00

(Gross tons.)

Axle turnings, Cleveland	$16.75 to 17.25
Axle turnings, Buffalo	17.50 to 18.00
Busheling, No. 1, Buffalo	20.00 to 21.00
Busheling No. 1, Pittsburgh	18.50 to 19.00
Busheling, No. 2, Buffalo	15.00 to 15.50
Bundled sheets, Pittsburgh	16.00 to 16.50
Bundled sheets, Cleveland	14.50 to 15.00
Bundled sheets, Buffalo	14.50 to 15.00
Bundled tin, Buffalo	15.00 to 16.00
Car wheels, (iron), Pittsburgh	25.00 to 26.00
Car wheels, (steel), Pittsburgh	27.50 to 28.00
Car wheels, Chicago	22.00 to 22.50
Car wheels, eastern Pa.	22.50 to 23.50
Car wheels, Buffalo	22.00 to 22.50
Car wheels, New York	20.00 to 20.50
Car wheels, St. Louis	24.00 to 25.00
Car wheels, Birmingham	17.00 to 18.00
Car wheels, Cleve.	24.00 to 24.50
Tram car wheels, Birmingham	15.00 to 16.00
Cast borings, New York	12.00 to 13.00
Cast borings, eastern Pa.	14.00 to 15.00
Cast borings, Buffalo	11.50 to 12.00
Cast borings, Pittsburgh	12.50 to 13.00
Cast, No. 1, eastern Pa.	21.50 to 22.50
Cast, No. 1, Pittsburgh	20.50 to 22.00
Cast, No. 1, Birmingham	18.00 to 18.50
Cast, heavy No. 1, N. J. points	19.00 to 19.50
Forge, No. 1, eastern Pa.	16.50 to 17.50
Frogs, switches, guards, St. L.	23.50 to 24.00
Grate bars, Buffalo	15.50 to 16.00
Grate bars, N. J. points	15.50 to 16.00
Heavy axle turnings, Buffalo	15.00 to 15.50
Heavy melting steel, Pittsburgh	27.00 to 28.00
Heavy melting steel, Buffalo	25.00 to 26.00
Heavy melting steel, Chicago	23.50 to 24.00
Heavy melting steel, Cleveland	27.00 to 28.00
Heavy melting steel, Cincinnati	21.00 to 22.00
Heavy melting steel, eastern Pa.	24.00 to 25.00
Heavy melting steel, New York	21.00 to 22.00
Heavy melting steel, St. L.	24.50 to 25.00
Heavy melting steel, Birmingh'm	21.00 to 22.00
Hydraulic pressed sheet, Cleve.	18.00 to 18.50
Hydraulic pressed sheets, Pbgh.	20.00 to 20.50
Hydraulic pressed sheets, Chgo.	18.25 to 19.25
Iron rails, Chicago	31.00 to 32.00
Iron rails, Buffalo	25.00 to 26.00
Iron rails, Cincinnati	25.00 to 26.00
Iron rails, St. Louis	26.00 to 27.00
Iron rails, Cleveland	30.00 to 31.00
Iron axles, Pittsburgh	39.00 to 40.00
Iron axles, Cincinnati	41.00 to 42.00
Iron axles, eastern Pa.	38.00 to 40.00
Iron axles, Chicago	42.00 to 43.50
Iron axles, Buffalo	45.00
Low phos. steel, Buffalo	30.00 to 32.50
Low phos. steel, Pittsburgh	30.00 to 32.00
Low phos. steel, eastern Pa.	32.00 to 34.00
Machine shop turnings, Buffalo	11.50 to 12.00
Mch. shop turnings, New York	11.00 to 12.00
Mch. shop turnings, Pittsburgh	12.00 to 12.50
Mch. shop turnings, eastern Pa.	13.00 to 14.00
Mch. shop turnings, Birmingham	10.00 to 11.00
Malleable railroad, Cleveland	22.50 to 23.00
Malleable railroad, Buffalo	23.00 to 24.00
Malleable railroad, Pittsburgh	21.00 to 21.50
Malleable railroad, eastern Pa.	18.00 to 19.00
R. R. and mch. cast, No. 1 Bfl.	22.00 to 23.00
R. R. wrought, No. 1, Buffalo	30.00 to 31.00
R. R. wrgt., No. 1, eastern Pa.	27.00 to 28.00
City wrought, New York	19.00 to 20.00
R. R. wrought, No. 1, Pbgh.	23.00
R. R. wrought, No. 1, B'ham	21.00 to 22.00
Reroll. rails, 5 ft. and ov., Pbg.	30.00 to 31.00
Reroll. rails, 5 ft. & ov., Chgo.	31.50 to 32.50
Reroll. rails, 5 ft. & ov., E. Pa.	27.00 to 28.00
Reroll. rails, 5 ft. & ov., St. L.	29.00 to 29.50
Shafting, New York	26.00 to 28.00
Shafting, eastern Pa.	28.00 to 30.00
Shoveling steel, Chgo.	21.50 to 22.00
Shoveling steel, St. Louis	20.50 to 21.00
Steel rails, short, Chgo.	27.00 to 27.50
Steel rails, short, Cleveland	28.00 to 29.00
Steel rails, over 6 ft. Cleveland	26.00 to 27.00
Steel rails, old, Birmingham	21.00 to 22.00
Steel rails, short, St. Louis	27.00 to 28.00
Steel car axles, Birmingham	36.00 to 37.00
Steel car axles, New York	38.00 to 40.00
Steel car axles, Buffalo	35.00
Steel car axles, Cleveland	50.00 to 51.00
Steel car axles, Pittsburgh	39.00 to 40.00
Steel car axles, eastern Pa.	38.00 to 40.00
Stove plate, N. J. points	16.00 to 16.50
Stove plate, Birmingham	12.50 to 13.50
Stove plate, Buffalo	15.50 to 16.00
Stove plate, eastern Pa.	17.00 to 18.00
Stove plate, Pittsburgh	14.00 to 14.50
Wrought pipe, Buffalo	17.00 to 17.50
Wrought pipe, eastern Pa.	19.00 to 20.00
Wrought pipe, New York	17.00 to 19.00

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Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
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(Steel.)
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BANDS.
(Steel.)
Akron-Selle Co., The, Akron, O.
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BARS—ALLOY.
Central Steel Co., The, Massillon, O.

BARS.
(Concrete Reinforcing.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS.
(Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
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Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

BEAMS, CHANNELS AND ANGLES.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS.
(Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS.
(Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING.
(Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING.
(Chain.)
Link-Belt Company, Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BENCHES.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES.
(Drawing.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL, RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BESSEMER SQUARES.
(Soft.)
Witherow Steel Co., Pittsburgh, Pa.

BILLETS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wickwire Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BINS.
(Steel.)
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE TUYERES.
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS.
(Chain.)
Yale & Towne Mfg. Co., New York City.

BLOOMS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O

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